(No. 7)

INTERNATIONAL CONTROL OF OUTER SPACE

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[No. 7]

INTERNATIONAL CONTROL OF OUTER SPACE

THURSDAY, MARCH 5, 1959

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C.

The committee met at 10:15 a.m., in room 356, Old House Office Building, Hon. Overton Brooks (chairman) presiding.

Present: Representatives Brooks, McCormack, Fulton, Miller, Anfuso, Osmers, Sisk, Van Pelt, Quigley, Bass, Wolf, Karth, Daddario, Moeller, King, and Roush.

The CHAIRMAN. The meeting will come to order.

We are certainly pleased to have a former colleague of ours, a former member of this committee, and now U.S. Senator from the Empire State of New York this morning as our first witness. I refer to Senator Kenneth B. Keating, from New York.

Mr. Fulton wanted to make some remarks. We are happy you are back here with us. We hope you come often to visit with us. You will be welcome here at any time, Senator Keating.

Senator KEATING. Thank you very much, Mr. Chairman, I certainly appreciate that.

Mr. FULTON. On behalf of the Republican side I would likewise like to welcome Senator Keating and say we all recall the good work he did on the select committee last year when the basic policies and foundations were laid for the current Committee on Science and Astronautics. We in the Congress are working with both Houses in order to come up with a U.S. policy on space and astronautics, as well as on the broad field of science, and I am sure we welcome Senator Keating here and his views this morning.

Senator KEATING. Thank you very much, Mr. Fulton.

Mr. ANFUSO. As a member from New York, I might say, Mr. Chairman, I have known Senator Keating for a very long time. I think he is a very sincere and dedicated public servant. I have read his statement today and I think it is one of the most brilliant statements I have read on the subject.

STATEMENT OF HON. KENNETH B. KEATING, SENATOR FROM THE STATE OF NEW YORK

Senator KEATING. I appreciate that very much. I am very proud to have been invited to come here and express the views I may have on this interesting subject, which as you know, Mr. Chairman and members of the committee, engaged my interest when I was on the committee.

I am happy that this group has been set up in this way. I know that the chairman will perform in a distinguished manner as chairman of the committee. He is well flanked on both sides by a couple of oldtimers that certainly know this subject as well as anyone.

I am greatly impressed with the importance of the subject which this committee is dealing with.

The United States has made great scientific strides in the year and a half since Sputnik I began its historical orbit around the Earth. Within a few months we had our first satellite, Explorer I, circling the globe with an apogee of some 1,600 miles. This has been followed by about half a dozen other successful orbiters and two space probers which penetrated into space to distances of 71,300 and 63,580 miles, respectively. And just 2 days ago our first Sun rocket was successfully launched.

I am confident that within the next decade we shall place a man on Earth's own satellite—the Moon. Nothing should be spared to assure our eventual leadership in this new field of astronautics. A second-best position behind Russian in this space race could spell disaster for the whole free world.

Americans are fully aware of the scientific challenge with which we are confronted, and I have no doubt of this Nation's willingness to make whatever sacrifice is necessary to meet that challenge. But it would be a fatal mistake to approach the space era solely in terms of satellites and solar probes. While we must not slacken our great technological effort, it is of importance also that we develop an appropriate basis for meeting other vitally significant aspects of the space era.

I believe that there has not been enough emphasis on the necessity for adapting some of our earthbound concepts to the requirements of this new age. For that reason I am very gratified at this committee's initiative in centering attention in these hearings on one of the most pressing of all the new nonscientific problems raised by the space age—the need for new rules of law for the settlement of space controversies. I don't state that strong enough. I commend in the highest terms this committee for taking up this subject which is fraught with so many problems and difficulties, but which is so important, it seems to me, to our development in this field.

It may be, as many people claim, that it will be the scientists who will chart the future course of the world. Their spectacular achievements certainly have merited them unparalleled eminence. But the scientists cannot be counted upon or expected to keep our moral progress abreast of our scientific advances.

This responsibility ultimately lies with the people, and they will properly expect their lawmakers to take the lead in proposing the new concepts and principles which are necessary. These hearings can serve an historic purpose if they result in even the most tentative first steps in the direction of devising a new legal code for the space age.

There are some who underestimate the serious consequences of any lag between legal and scientific developments. They recall with nostalgia the centuries required for the flowering of the common law, and fondly anticipate similar development of the new space law. I grant that law is shaped and nourished by experience, but I also insist that it is fundamentally based on necessity. The necessity for new laws and concepts in this case is overwhelming.

There will be no time for legal craftsmanship and judical speculation after rival claims are made to the moon or to space itself. Civilization has now reached a point at which a gap between our moral and

technological tools could be fatal. The rule of law in the age of space is not a matter of philosophy, but a matter of survival.

The legal problem is not a new one. Down through the ages man has striven to attune his legal codes to progress in other fields. Constant change to insure maximum justice has been the hallmark of progressive and successful legal thought.

History reveals that the physical sciences did not reach fruition until the proper moral climate had been achieved in civilized sectors of the world. This was brought about by the rise of mature religions and the promulgations and acceptance of legal standards by which man's conduct could be guided.

We have made some progress in dealing with this new dimension of our national existence, but much remains to be done. One of the important steps in the right direction was the enactment of legislation for a new National Astronautics and Space Agency. This legislation authorizes the Agency to develop a comprehensive program of research and development in aeronautics and space science "and related matters."

I emphasize the phrase "and related matters," which was added to the original bill by this committee, or its predecessor. In my judgment these words were added among other reasons to make it clear that the Agency should consider the legal as well as scientific aspects of our space program. I hope that this committee will confirm my interpretation and reexpress the intention of Congress that the exploration and regulation of our interplanetary exploits must develop hand-in-hand.

I have also been very gratified by the proposals made by the United States to the United Nations for international cooperation in the exploration of outer space. This was concrete evidence of this Nation's determination to foster world peace and security. It revealed in a most dramatic and impressive manner our intention to do all we can to use the new discoveries from space exploration for the benefit of all mankind.

I have long advocated such a course by the United States. More than a year ago I urged the following three-point program for international action: First, an immediate declaration that outer space was not subject to appropriation by any nation; second, an international agreement barring the use of outer space for any military purpose; and third, the creation or utilization of an international agency for the joint exploration of outer space.

Such a program is urgently needed to promote a universal dedication to the development of outer space for peaceful, scientific, and humanitarian objectives.

We should all be gratified at the initiative taken by the United States to block the use of outer space for military purposes and to shower its benefits on all mankind. Our proposals in this field should have a profoundly favorable effect on world opinion. They are a most fitting response to the challenge of outer space by a nation dedicated to man's constant spiritual and material advancement.

These are the broad outlines of the Government's response to the nonscientific problems of outer space. I advocate two additional steps to complete our reorganization for the space age. First of all, I propose that there be established a Federal Department of Science and

Research or its equivalent. Such a department could coordinate the efforts of agencies such as the NASA, the Atomic Energy Commission, the National Science Foundation, and the Bureau of Standards.

It would consolidate under one roof all fields of scientific endeavor in which our Government has an interest. This would facilitate the coordination of all these activities and guarantee Cabinet-level consideration of the Government's overall undertakings in this field.

My second proposal is I am sure somewhat controversial and will not be acceptable to all members of this committee, I feel sure, but it is that there be established a joint congressional committee on outer space, modeled after the Joint Committee on Atomic Energy.

At present each House has its own separate committee on outer space. In addition, other committees in both Houses, such as the Armed Services and Foreign Affairs Committees, are continuing to exercise their jurisdiction over some of the problems in this area.

This has meant that a great deal of valuable time of our top scientists and military experts is being spent on Capitol Hill instead of in the laboratories and on the proving grounds. While the testimony of these experts is, of course, essential to the work of Congress, the creation of a single joint committee would avoid duplication and greatly expedite matters.

These are problems primarily of Government organization. There are many, many more legal problems of direct practical concern. One of these is the question of who owns space—or even more fundamentally, the problem of what is space. In Coke on Littleton we find the maxim:

> To whomsoever the soil belongs, he owns also to the sky and to the depths. The owner of a piece of land owns everything above and below it to an indefinite extent.

This maxim barely survived the age of aeronautics. It holds little promise for the age of astronautics.

In 1902, shortly after the Wright brothers' first flight, a convention was proposed under which the air would be free to commerce and travel just as is the sea. This proposal was rejected. During the First World War, each nation began to assert exclusive control of the airspace over its territory.

After the war, the law of absolute sovereignty over airspace was formalized in the Paris Convention of 1919. This provided that "every power has complete and exclusive sovereignty over the airspace above its territory." This principle has since been consistently adhered to in domestic legislation as well as in international treaties.

Significantly, the term "airspace" has never been defined in any of these treaties. Scientists have now established that there is no fixed separation between airspace and outer space. It is apparently that law and science will have to join forces in arriving at an acceptable definition of these terms.

Suppose one were to attempt to apply the principles of established international law by extending the boundaries of each nation into outer space. Because of the curved face of the earth, the extension would produce an inverted cone which would grow bigger and bigger in relation to the country as it reached farther into space.

At some point these cones would overlap and more than one state would be occupying the same airspace. Moreover, the continuous

movement of the earth on its axis means that the relationship of particular areas on the surface of the earth to space beyond the atmosphere would be constantly changing.

These solar facts illustrate the impossibility of applying existing concepts of international law to the control of outer space. In my opinion, space beyond the atmosphere must remain the common property of all the nations, or, what is the same thing, the property of no nation.

Another legal problem is determining the rights of nations to terrestrial bodies. Here again, it is doubtful that the present earth-bound rules of discovery and occupation are suitable. I believe that only an early and firm assertion of international jurisdiction over such areas will avoid the kind of territorial conflicts in outer space which have plagued the earth for its entire history.

Looking ahead, it is apparent that we will also need new laws for the protection of persons, industries, and territories from misguided missiles and plunging Pioneers. Rules will have to be devised with respect to liability for injury or damage from activities in outer space. What would you say as to the launching nation's liability for damages if a satellite were to come crashing down on this room at this very moment?

I believe that an immediate start should be made in drafting a code for outer space which would cover such contingencies and numerous others. It could provide for such things as the filing of "flight plans" to prevent interstellar collisions and confusion; it could regulate spacecraft broadcast so as to avoid interference with present frequency allocations; it could set forth return-to-earth covenants, navigational guides, and the like.

If we act in this field now, we can avoid the pitfalls which confront attempts to deal after the fact with comparable problems arising out of travel on the high seas and in the air and in the exploration of Antarctica.

Many legal scholars are pondering these problems. The American Bar Association has already organized a standing committee on space law. The International Astronautical Federation has become active in the field. Articles on the subject have been appearing in the legal periodicals. A report of the International Law Association deals extensively with these problems.

I have been very pleased to learn that these questions are being given serious consideration even by Soviet legal experts. A recent issue of a Russian legal periodical carried an article urging that no government be permitted to incorporate any portion of interplanetary space under its jurisdiction.

The article suggests that a government's sovereignty over the space above its territory should be limited to a height sufficient to safeguard each nation from encroachments on its territory or from threats to its independence.

In a more practical vein, the author urges that all satellites and other bodies sent into space be required to have identifying marks so that responsibility can be assigned for any damage caused by their falling back to earth. The article also recognizes the need for international agreement on assignment of radio frequencies for signaling apparatus sent into space.

This is particularly interesting, since a complaint has been filed with the Federal Communications Commission protesting the Russian sputnik's use of radio frequencies in violation of international agreements for radio frequency allocation.

The official Russian line expressed by its representatives at the U.N. does not justify too much optimism about the adoption of needed international agreements for the legal control of space. Still we must not give up hope. A genuine international effort to define the rights of all nations in space is one of the world's compelling needs.

Anarchy in space could be more dangerous than anarchy on earth. The United States should move ahead in this field with or without Soviet cooperation. If we succeed in promulgating a code which is reasonable and fair, world opinion might force its enactment as the law of the universe. Success in this effort, in the long run, may constitute our Nation's greatest contribution to the cause of peace and progress in this new era.

The CHAIRMAN. Thank you very much, Senator, for what I agree with my colleague is a brilliant statement.

Senator KEATING. Thank you, Mr. Chairman.

The CHAIRMAN. I think, too, your concluding paragraph could well point the way to outstanding legal accomplishment which this Nation could give to mankind for many, many generations ahead, akin to something like the code of Justinian.

I am from a civil law State. We know a good deal about the civil law. It seems to me in compiling a code of laws we would have to proceed on the basis of setting up the principle of law rather than on the basis used in framing the common law, which was by separate example and then forming the principle from a series of examples.

That is correct, is it not?

Senator KEATING. I would think that is so, yes.

The CHAIRMAN. So in effect we would be following principles of the civil law—I mean the idea behind the civil law, which is, to begin with, a principle, and work it out fairly and equitably so as to form a basis of jurisprudence. That is right, isn't it?

Senator KEATING. I would think that is so. I haven't thought of it in that light, but it impresses me that that is the way we would have to approach the problem.

The CHAIRMAN. There are a number of matters I want to mention to you because we don't have the opportunity often to talk to and interrogate a member of the other body. This is a golden opportunity.

Senator KEATING. I hope you will keep your questions in the field of space, Mr. Chairman.

The CHAIRMAN. I mention the matter of the civil law. Of course, in reference to your suggestion regarding a Department of Science, it seems to me that we are moving in that direction. Of course, this committee itself over on this side may not have jurisdiction of that legislation. Nonetheless, we can emphasize the importance of it and we can point the way toward that accomplishment.

I think that you are correct in making that suggestion. In reference to the other suggestion, and you refer to the fact that there may be some opposition to it over here, you are familiar with what happened in the select committee. We recommended a joint committee and that was turned down later on by the select committee, and then by the House of Representatives.

So we have now a standing committee, which is this committee. But it seems to me even with a joint committee you would have still the problem that you refer to, which is jurisdictional.

Isn't that correct?

Senator KEATING. Yes. I had the feeling that the joint committee setup had worked very well in the Joint Committee on Atomic Energy, and that this was as closely akin to that as anything could be. Having served in the House for 12 years, I am conscious of some of the drawbacks of a joint committee. But as a Member of the House, as the chairman knows, I did favor then the joint committee idea, and I still do in this case because I have been told by some of the scientists and people concerned with these problems in government that they are spending time out of proportion to what they should spend in appearing before various congressional committees. There were so many of them.

The CHAIRMAN. That unquestionably is true. We have to make our legislative processes work properly by ironing out the small matters of jurisdictions so as to use the minimum amount of time from high officials in the executive branch of the Government. I think that is correct. You agree to that?

Senator KEATING. Yes; I do agree to that. I had the impression that perhaps the formation of a joint committee would be a step in that direction.

The CHAIRMAN. I want to ask you in reference to your idea about the use of space: As I read here on page 4, you have the idea that space should belong to no one and should be owned by every nation.

Senator KEATING. Either way you put it, one or the other.

The CHAIRMAN. Would you apply the doctrine of freedom of the seas?

Senator KEATING. It is akin to that. It is akin to the doctrine of freedom of the seas. Of course, freedom of the seas has some restrictions on it. I suppose you could say that it depends on how you define outer space. We had a great discussion over that in the committee last year. There must be an area above the land in each country where that country can protect its own sovereignty, and how far that is to go, I am not well enough informed to estimate. But beyond that, I think there should be complete freedom of any nation to explore or send its objects.

The CHAIRMAN. Unless you have that theory, a small nation will be in great difficulty using a satellite under any circumstances.

Senator KEATING. Yes, I think that is true.

The CHAIRMAN. Or sending up a missile, because to confine that missile within the air and space boundaries immediately above the nation itself would be very difficult—sort of like drilling an oil well which if you drilled very deep on a small tract of land, may go under the adjoining tract of land and drain from it. That is the same principle in reverse; isn't that right?

Senator KEATING. Yes, I think that is so.

The CHAIRMAN. Mr. Fulton?

Mr. FULTON. I will yield to Mr. Van Pelt.

The CHAIRMAN. Mr. Van Pelt.

Mr. VAN PELT. Senator, the only question I have here, if you would elaborate on it a little bit more, on page 3, "an international agreement barring the use of outer space for any military purposes."

Senator KEATING. I imagine what is bothering you is probably the same thing that bothers me. How do you bring about an international agreement with some of the intransigent nations that we have to deal with?

I think all we can do is push for it. I think that the impact of public opinion, international public opinion if we do push for it, would be good, and we may be able to bring it about.

Of course you have the question of how you are going to enforce it to be sure that it is lived up to.

Mr. VAN PELT. The principal reason for my question was the testimony we have had with regard to communications as they would affect the military.

Senator KEATING. Testimony before this committee?

Mr. VAN PELT. Yes, and what they look forward to in the event of communication with satellites.

Senator KEATING. I didn't mean that the military could not use the facilities, just as any other branch of the Government. Let's say we develop our communications and our electronic advances are such that we are able to use outer space for the purposes of our military, I didn't mean to bar the military from using—the military of any nation—from using those communications.

In the agreement I think it would have to be clear that the military had the same rights and privileges as civilian defense or the Department of Agriculture or anybody else in using the communication facilities.

Mr. VAN PELT. Thank you. That is all.

The CHAIRMAN. Mr. Miller?

Mr. MILLER. Senator, I am concerned with the statement you made about the great amount of time that the administrators spend before meetings of the Congress. Isn't it a fact that the people who come before us as the administrators, though they may be scientists and may have gotten their position because of their great knowledge on this specific subject, in the final analysis are administrators. Do they spend time in the laboratories when they are away from such details as appearing before Congress? Or are their duties primarily administrative in making sure that the agency under them functions properly and that those who are the actual scientists can go into the laboratories and function properly?

Senator KEATING. There is much to what you say, that they are mere administrators. I don't want to create the impression with this committee that there has been any great stream of these people who have been complaining to me about the amount of time they spend on Capitol Hill. That is something we hear often from members of the executive branch. You hear that periodically.

It is necessary that they appear here, and it is part of our American system of doing business.

All I think is that a fellow like Von Braun or Dr. Killian or someone of that kind—and I use those just as eminent names—we ought to, as far as we can and still do our duty as a legislative branch, cut down on our calls on their time because of the great amount of work which they have.

Mr. MILLER. I agree with you, because they have a big job in keeping their machines running.

On the other hand, we are responsible for the spending of the people's money, for the establishment of these agencies and making sure that these agencies function in the public welfare. I don't see how we can do it, irrespective of the superficial statement that can be made that they are spending too much time before us, unless we ask them to come here.

I want to make it clear, too, I have never heard any of these men complain about this. I think they recognize the responsibility that we have to people and that they in effect are our agents.

Senator KEATING. Even when I mentioned that two or three had spoken of it, it was not in a complaining vein. It was simply with a smile on their faces. "You know you fellows take a lot of our time up there," which they recognize as necessary.

All I was meaning to imply was that insofar as we can and still do our job properly, we ought to cooperate with them on not calling them here more than necessary.

Mr. MILLER. It is a good deal like going to the dentist. You and I go to the dentist because we realize that it is essential and necessary to do it, but we don't have the smile on our face when we get into the dental chair.

Senator KEATING. That's right.

Mr. MILLER. I was interested in the introduction in comparison with the freedom of the seas. There have been some reports recently gotten out by the Academy of Sciences on oceanography. We are beginning to find, now that we are beginning to penetrate beneath the surface of the sea, that there are valuable metals there.

Over the years we have pretty well established the rights of fishermen, and also oil beyond the continental limits of these countries.

Don't you think that sooner or later we are going to have—and we have just had a conference in Geneva on the reestablishing of the law of the sea—don't you think that sooner or later we are going to have to take a look at the laws as they pertain to the sea and those things under the sea that were once a mystery and closed off to us?

Senator KEATING. Yes, I do. I think we have another big subject there, because certainly we may have a general recognition within a few miles of our borders. Even that they can't agree on. The nations can't agree on how far out from the shore the sovereignty of each country shall extend. When you get out in the middle of the ocean, if you start exploring there, as they are talking of doing now, whose property is that?

Mr. MILLER. I think, Mr. Chairman, you have some oil wells off the coast that are 80 miles out in the gulf.

Senator KEATING. That's right. I have been there. I came down in a helicopter and landed on some of those rigs out there.

The CHAIRMAN. We have plenty of problems, too.

Mr. MILLER. What would happen if an unfriendly country sent a big boat out there and started to drill? Is there a law by which we could stop them?

Senator KEATING. That is one of the things which a subcommittee of the House Committee on the Judiciary is now concerned with, chairmaned by my erstwhile distinguished colleague Edwin Willis. It is a very big problem. We wrestled with it and came up with no answer in the last session.

Mr. MILLER. I think in these things we have a great challenge. I notice, sir, on the first page of your statement you say: "A second-best position behind Russia in this space race could spell disaster for the whole free world."

I wonder if you also meant, besides that, also in our Defense Establishment?

Senator KEATING. Definitely.

Mr. MILLER. Because there has been some statement that we can't be ahead in everything, which indicates we are going to be second-best in some things. I don't subscribe to that.

Senator KEATING. I don't mean to imply by that, to have the strongest defense in the world we must be ahead in every single element of that defense. What I say is that our overall defense must be the best, just as our overall space development must be the tops.

That, I think, is the No. 1 problem which faces our country.

Mr. MILLER. If you analyze it, and there are certain facets that go to make up this defense, can we say the diamond is perfect if any one of those facets has a flaw? Can we say that we have a defense if anything that goes to make the defense—whether it is logistics or air or missiles or submarines—is second?

If it is important in the defense inventory, isn't it all-important and shouldn't we be first?

Senator KEATING. I don't know that you and I have any different philosophy on that. Experts can legitimately differ over the relative value of a Navy, let us say, the relative value of submarines, the relative value of bombers or missiles. I do not say that to have the best defense you must be the best in every single department.

It would be very nice to be the best in every single department, but I don't think that is essential to being ahead overall.

What I do think is essential is that you are convinced that you are on top in your overall defense effort and defense capability.

Mr. MILLER. You don't think, then, that you allow a weakness when in any of those elements—now, I don't say we should have the best cavalry in the world. Cavalry is out. Or that we need the best archers in the country because we don't use archers any more.

But I can't conceive that we should be second to any nation, for instance, in the value and the number—not that we qualitatively should be second to any nation in submarines in this country, that qualitatively we should be second in any element of defense.

Senator KEATING. I don't think we should be second in any of the well-recognized elements of defense. I don't want to be second. I think we should be first in those elements of our defense which are recognized as essential in modern warfare.

Mr. MILLER. Any one we are second in, doesn't it become the weak link or the Achilles heel?

Senator KEATING. Warfare is too complicated in my judgment to make a categorical answer to that. It at least is something for us to be concerned about. Whether it would be the particular weakness which would be taken advantage of in an emergency is another question.

Mr. MILLER. I want to join in congratulating you, sir, upon this very fine statement.

Senator KEATING. Thank you very much. I appreciate that.

The CHAIRMAN. Mr. Fulton, do you have a question?

Mr. FULTON. We are glad to welcome you, and I think your statement is excellent. As a matter of fact, it lays down the broad outlines that this committee should be interested in, in getting a good approach to the law of space.

I am pleased to see that you have not forgotten the House when you referred to the Foreign Affairs Committees of the two bodies, because the Senate Committee being the Foreign Relations Committee and the House Committee being the House Foreign Affairs Committee, you still adopt the House terminology for both committees.

Senator KEATING. I am appearing before the House.

Mr. FULTON. We are complimented. May I refer to your statement on page 5. That is, in the third paragraph, where it says:

> Because of the curved face of the earth, the extension would produce an inverted cone which would grow bigger and bigger in relation to the country as it reached farther into space. At some point these cones would overlap and more than one state would be occupying the same airspace.

I was going to be a scientist and a mathematics teacher at one point, and I don't believe they will overlap. If you take a cord from the center of the earth out through the earth's circumference and then extend that indefinitely, one side of the line will be the boundary of one piece of property, and the other side will be the boundary of another piece of property.

They never overlap the farther you go into space because you have the same line extended. It is a straight line vertically, so you can't do it unless you go in a circular direction.

Senator KEATING. But the earth is revolving on its axis all the time and you have got——

Mr. FULTON. I would ask for a committee vote on this.

The CHAIRMAN. You want a committee vote, and I don't want to vote on that.

Senator KEATING. I am no scientist. That is the way it strikes me, that if you reach out like this from the United States, and you reach out like this from England, somewhere up there as they kept branching out farther, you would overlap.

Mr. FULTON. If you extended a straight line indefinitely from one piece of property on that line and the other piece on the other side, each one is going to be always on his own side of the line. You could carry that out to infinity and it would never overlap because the straight line is the boundary and it comes from the originating point at the center of the earth and goes through the circumference of the earth at a particular point or two points, two lines.

Senator KEATING. I know that the gentleman from Pennsylvania is a mathematician.

Mr. FULTON. No; a Congressman.

Senator KEATING. Well, a former mathematician. I presume his knowledge of this is superior to mine. This idea is not original with me. I picked it up from some scientist, and I played around with the idea. It may be wrong. It struck me as a reasonable statement.

You think as a scientist that the boundaries of a particular country as they go out into outer space would remain static and there would be no overlapping?

Mr. FULTON. Let's take that theory. Suppose we would take a perpendicular line on the boundary line of each nation, or let's make it simpler. Let's take a plot of ground 1,000 feet square. We then go up 100,000 feet. If we take it perpendicular to the earth's circumference, we will then find that the pieces of property when they are each up 1000,000 feet are separated from each other.

At 100,000 feet, the division between the properties will be 2½ feet on each side in space at 100,000 feet, If you go up, extending the lines parallel to each other and perpendicular—if you just carry the parallel lines up like a chimney and get to 100,000 feet, you have a piece of property 100,000 feet square, and you will be 2½ feet on every side away from your neighbor.

Senator KEATING. Isn't it a fact that—I don't know whether you call it an atom or what you call it—but the piece of space that is right up above my finger 100,000 miles right at this moment is over the United States. But isn't that going to be over Russia in a few hours, and isn't that——

Mr. FULTON. I don't think the word is "over." It is just out there. And I do like your feeling about the fact that maybe we should define outer space as the place where, for security purposes, no nation should have sovereignty or the control or the power to control. I think that is a good concept.

But I don't like the feeling of owning a particular bunch of electrons and neutrons or space particles clear out in some sort of a cone or in a pyramid. I think that loses value at a certain point under a legal concept. If you take the common law definition of ownership, it is either control or the power to control. If nobody has it, you would then get into a place where the two hunters shot the stag and you find, when you arrive there, one hunter was there first and there are two arrows in the heart. Who owns the stag? They can each identify their arrows. That might occur with the United States and Russia approaching the moon.

Suppose Russia first plants a flag on the moon with a shot. Do you think that gives Russia the ownership of the moon?

Senator KEATING. I don't think it should. Or if we plant one, I don't think it should.

Mr. FULTON. Or do you think that if Russia first put an armed man on the moon with a flag, that they then had the power to control the moon and we should then get her permission before we land on the moon?

Senator KEATING. No; but I think that if they did, they would make that claim. They would claim that was comparable to exploration on earth and that they did have sovereignty over the moon because of having been there.

That is why I urge that efforts be made strenuously to reach agreement now that that shall not be so.

Mr. FULTON. Would you make that through the United Nations or would you call the equivalent of a Hague Peace Conference? If you recall, 1899 was the first peace conference of The Hague, and all the major nations joined. As a matter of fact, on the invitation of Russia in 1907, we accepted an invitation to the second Hague Peace Conference.

If you put it under the United Nations, you leave Communist China out. So it would let her do anything she wanted in space. But if we call a Hague Peace Conference type of arrangement, it would mean the recognition of Communist China.

How do we get over that dilemma? Where do we come to on that?

Senator KEATING. I think the United Nations would be a good starting point.

Mr. FULTON. Would you put it under a regional federation, maybe under NATO or something like that originally, on a security basis? Would you put it in the Security Council without going to the General Assembly? Would you start on a regional basis, go to the Security Council, or go to the General Assembly?

Or would you go to the Trusteeship Council and make it a trusteeship?

Senator KEATING. I would go where the smallest bite can first be taken. In other words, this is something that takes a lot of groundwork. We know how difficult it is to get a major piece of legislation through the Congress. This is vastly more difficult than that. We have got to move a step at a time.

Mr. FULTON. For example, under the United Nations, we could have a trusteeship under the Security Council, a strategic trusteeship of the moon, or we might go to the General Assembly and get a General Assembly trusteeship.

Would you make such a move as that? Would you say to this committee that you should recommend that we go to the General Assembly or the Security Council of the United Nations and apply for a trusteeship of the moon as the most accessible heavenly body before something happens?

Senator KEATING. The form of such a recommendation I would want to give more thought to—whether it should be a trusteeship or how it should be handled. I would certainly hope that this committee would recommend that steps be taken, and I suggest through the United Nations.

It is possible that there is a better solution than that. I just don't know what it would be.

Mr. FULTON. As a practical matter, on the Caroline and Marshall Islands, we have a strategic trusteeship with the right to fortify, with the United States as trustee. Rather peculiarly, Russia did not oppose that, nor did they veto it. So there is an instance where on a security trusteeship we have been able to get along with Russia without a veto.

Possibly in this field, if that has occurred for strategic aircraft of the United States, it might occur in space. Would you recommend trying it?

Senator KEATING. I would surely recommend trying it. I would certainly recommend endeavoring to reach an agreement, and I would approach it with the idea that there is a mutuality of interests among all nations to reach some agreement, because who knows who is going to be first in any of these areas. I think it is to the advantage of all nations to reach such an agreement.

Mr. FULTON. At what level do you think the sovereignty of the United States or any nation ends in outer space?

Senator KEATING. You mean how many miles?

Mr. FULTON. Feet, miles, or distance.

Senator KEATING. I just don't know. I think that is a quasi-military question as to what is essential for the defense of the particular nation. I don't know how many miles that should be.

The CHAIRMAN. Will the gentleman yield?

You mean sovereignty like, we will say, gravity? Finally it runs out. Or does sovereignty remain, regardless?

Senator KEATING. I think it has to run out. I don't think you can have sovereignty of each nation indefinitely in outer space, or you destroy the concept that I have been discussing here. It may be a limited sovereignty.

Mr. FULTON. If you put it on the gravity base, you come to a certain point where the gravity loses its power and Kepler's law of motion of heavenly bodies takes over. Would you go out, then, as far as earth's gravity would reach?

Senator KEATING. That may be the answer. It is one of the definitions. I don't think it is the one you cited, but it is one cited as to where outer space begins. Maybe that's the place at which sovereignty should end. I have not a fixed opinion on where it should end.

Mr. FULTON. But you wouldn't put it on the basis of where air or an untenable atmosphere existed. You wouldn't put it on any basis like that because the X–15 will really be above our atmosphere, won't it?

Senator KEATING. That's right.

Mr. OSMERS. Mr. Chairman, will the gentleman yield? I have several questions I would like to ask.

The CHAIRMAN. The Chair will recognize Mr. Anfuso next.

Mr. OSMERS. I am not seeking recognition, Mr. Chairman. I am asking approximately how long the gentleman from Pennsylvania will continue his questions.

Mr. FULTON. I have already yielded to Mr. Van Pelt. I yield.

The CHAIRMAN. Mr. Anfuso.

Mr. ANFUSO. Mr. Keating, you speak about an international agreement as to the use of outer space. When we talk about agreements, as lawyers we talk about a meeting of the minds. We talk about contact with people, negotiation, and then finally reaching an agreement.

In order to establish agreements, would you favor immediately contacting our friends, our friendly nations, and would you also favor contact as soon as possible with Russia on the question of agreements? I am encouraged by your statement on page 6, where you said that a recent issue of a Russian legal periodical carried an article urging that no government be permitted to incorporate any portion of interplanetary space under its jurisdiction.

I take that to mean the Russians are probably disposed to agree on some basis of that kind and also make some agreement with respect to the moon.

Senator KEATING. This article—if you can judge from that—is quite favorable in that regard. We all know that those periodicals are not published and widely disseminated very much there, if the government has any real, serious objection to it.

But whether it does represent government policy or not, I don't know, of course. If it does, I think it is a rather encouraging sign.

Mr. ANFUSO. You are willing to explore it?

Senator KEATING. Yes, I would explore it. I know there have been some difficulties experienced in the United Nations with regard to the suggestion made by our country there. But I would assiduously press for an agreement of some nature.

Mr. ANFUSO. Would you do that as soon as possible?

Senator KEATING. I would.

Mr. ANFUSO. You would favor negotiations and talks with our friends as well?

Senator KEATING. Oh, yes.

Mr. ANFUSO. To get their ideas?

Senator KEATING. Definitely. They may have better ideas than we have in some respects.

Mr. ANFUSO. Senator, in speaking about agreements again, what areas of agreement do you think might profitably be sought? In particular, would you approve an agreement on the upper limit of national sovereignty?

Senator KEATING. I would. I would try to reach an agreement on that. We weren't very successful in the high seas, but that is a rather fundamental subject to get an agreement on, if possible.

Mr. ANFUSO. Would you include, for example, liability for injury or damage caused by space objects, internationalization of radio frequencies, require notice of launchings, and an international inspection system?

Senator KEATING. All of those things. I would try to get agreement on all of those things. I realize the initial agreement will never cover in detail all of those features. It is like all of our laws are built. But I think all of those things you have mentioned are important.

Mr. ANFUSO. In your opinion, Senator, what effect, if any, has the end of the International Geophysical Year had on the legal regime of outer space?

Senator KEATING. The Geophysical Year focused attention on a lot of these problems and accented it. There is always the danger that now that the year is over, there will be a relaxation in scientific advancement and achievement. But I don't think that needs to be a deterrent.

Mr. ANFUSO. I am sure the question of a reconnaissance satellite is going to come up. Do you believe the United States could properly object to the passage of a reconnaissance satellite above the national territory?

Senator KEATING. You mean in outer space?

Mr. ANSUFO. Yes.

Senator KEATING. In other words, not in the area which you and I would normally think of as a necessary extension of our sovereignty.

I think this: We are apt to object. Any other country is apt to object to reconnaissance of their country until we have some agreement on the subject.

Mr. ANFUSO. Some limitations.

Senator KEATING. In other words, if we had a satellite up there that we knew was there for the purpose of viewing what was going on in this country, we would try to shoot it down, and any other country would.

I think that it would then violate another thesis I have set forth here, an agreement not to use outer space for military purposes. As of today we would object, yes.

Mr. ANFUSO. Of course, Senator, that question would answer itself. Once we have established a limit, for example, a line so many thousands of miles above that, I suppose we couldn't object whether it was a reconnaissance satellite or not.

The same would apply to Russia. If we had a reconnaissance satellite over Russia——

Senator KEATING. I assume that is true.

Mr. ANFUSO. Senator, are you familiar—you are, I am sure—with the resolution approved by the General Assembly of the United Nations on December 12, 1958, for the establishment of a study committee on the problem?

In your opinion, if the establishment of this study committee occurs, is that a good step toward reaching international agreement in view of the refusal of Soviet bloc countries to participate?

You know, they did refuse to participate.

Senator KEATING. Yes, I know they did.

Mr. ANFUSO. As long as they refused, what alternatives can we offer within the United Nations?

Senator KEATING. I would go ahead with the study, even though they don't participate.

Mr. ANFUSO. And recognizing, Senator, how slow the U.N. is, I think you would pursue what we originally talked about, early negotiations with our friends, even with Russia, to try to reach agreements?

Senator KEATING. I would. And I recognize fully the difficulties involved in dealing with some nations. It tries your patience, but we should still make the effort.

Mr. ANFUSO. Thank you very much, Senator. You have been very enlightening.

The CHAIRMAN. Mr. Osmers.

Mr. OSMERS. Senator Keating, I assume from your statement that you believe that there is no life that would compare to human life on any of the other planets?

Senator KEATING. Well, I think the weight of scientific opinion is that there is not—comparable to human life.

I have no fixed opinions. I am not enough of a scientist to have any fixed views on that. I think it would be fair to say the weight of scientific opinion is that there is not similar life.

Mr. OSMERS. It would make a very profound difference on the type of space law that we would write if we learned that on Venus, Mars, the Moon, and other planets, they had a developed society which, while it might be entirely different from our own, would also have certain rights which we might not have any moral or legal right to take over.

Senator KEATING. It is conceivable that we have a problem of dealing with perhaps a more numerous, a more intransigent, and a more difficult group than any on this Earth. That is conceivable. And of course they would resent intrusion from any Earth characters in what they would consider their sovereignty.

You are quite right, I am assuming in all of this that there is no life or society comparable to ours.

Mr. OSMERS. I just wanted to say, Mr. Chairman, to the Senator, I have asked most of the witnesses who have testified before the Armed Services Committee, and here, who are going to shoot at the Moon—

I have asked them all what will you do if the Moon shoots back? They haven't seemed to be able to come up with an answer to that question.

You make two suggestions on page 4. One is that we establish a Department of Science and Research. I think this is a very, very serious proposal that we would want to examine carefully in view of what has come before this committee. I would like to ask a question in connection with the scope of that—again in the light of evidence that has been given here and elsewhere on Capitol Hill about our educational difficulties in this country.

Nearly every competent witness that I have asked about the scientific education programs in the United States has answered that the scientific education in the United States is inadequate generally for our entrance into a space age situation.

Would you include in the Department of Science and Research or its equivalent, as you mentioned here, would you include scientific educational activities under that department?

Senator KEATING. I am not prepared to answer that, really. I recognize the evidence, and the disturbing evidence, which you heard in that regard. But whether any educational activities should be taken out of the Department of Health, Education, and Welfare and put into this department or not, I just am not prepared to say. I don't like the idea of any Federal department controlling any phase of our educational activity. I belong to the school of thought that believes that that is better done at the local level. But I am very disturbed by the same thing that is troubling you about our scientific education.

Mr. OSMERS. Let me see if this question might lead to an opinion that would be helpful to the committee. I agree, too, that if it is possible, we should have as much local autonomy with respect to education as possible. But do you feel, Senator, that the Federal Government, as a matter of national survival, should play a stronger part in the education up to and including the secondary level in this country at this time?

Senator KEATING. I am inclined to think so. I am inclined to think that by encouragement and impetus, it may be desirable. Now I haven't heard as much of this evidence as you have in your capacity on the Armed Services Committee and this committee. So you would be better equipped to decide that than I am.

But I am rather disturbed—I don't want to say alarmed—at the fact that our scientific education has not seemed to keep pace with what is required for our national security.

Mr. OSMERS. The reason I persistently stress it, Mr. Chairman, is this: We have a great many proposals made to Congress. I have made some of them myself. They are all to give financial aid to school districts, to build buildings, to help perfectly worthwhile objectives, to provide scholarships.

But no active proposal that I am familiar with before the Congress today, proposes that, as a matter of national policy and survival, that the Federal Government—not start running the schools, but begin to establish certain standards of performance and standards of scientific accomplishment among the young people in school today that will contribute materially to the survival of the Nation and to the advancement of science and to keeping pace with, shall we say, some nations which are known to be unfriendly to some of our objectives.

Senator KEATING. As I say, I oppose generally Federal intrusion into our school systems.

Mr. OSMERS. I do, too.

Senator KEATING. I favor—and I think it is extremely important—that we balance our budget. But both of those principles must yield to our national security and our national survival.

The security of our country must be, in the mind of any legislator, the No. 1 concern. All of these other things must yield to that, because if we are wiped out and we are not here, we can't enjoy any of these things—even our freedoms. So that must be our No. 1 objective, above everything else.

Mr. OSMERS. Mr. Chairman, just one final question. Your second proposal on page 4, Senator, provides that there be established a Joint Congressional Committee on Outer Space. Does that proposal assume that the respective Science and Astronautics Committees in the House and Senate would be abolished and replaced by a Joint Congressional Committee on Outer Space?

Senator KEATING. I suppose as a practical matter that is what would happen, and that outer space would be extended to some of these other areas. I am not sure that there would be enough for this committee to do if the astronautics problems were taken away from it.

I am not 100 percent certain that that is so, but it would presuppose that everything to do with astronautics would be taken away from this committee and away from the comparable Senate committee and placed in a joint committee.

Mr. OSMERS. That brings one final question, Mr. Chairman, to mind. So much of the subject matter that has come before this committee has had national defense significance, been of significance to national defense, and another proposal here to establish a joint congressional committee on outer space—I am afraid that with our Joint Committee on Atomic Energy that we may be backtracking as a Government, back to the days when we had the service rivalries that we had when we had a Committee on Military Affairs and a Committee on Naval Affairs, and that type of division of effort and division of thought in the national defense field.

I think it is pretty hard to say where the Department of Defense and where the National Aeronautics and Space Administration begins and where this committee begins and ends. I think it is a matter that will have to be reviewed constantly by the leadership of the House and Senate to see that we do keep abreast and keep tight.

We have had some complaints around this country that we have had rivalry between the Army, Navy, and the Air Force. Now we will probably have some complaints that we have rivalry between the Army, Navy, the Air Force, the National Astronautics and Space Agency, the National Science Foundation, and a dozen other new agencies.

The CHAIRMAN. Let me tell the gentleman this. This committee is not going to abandon its prerogatives any time soon. We are going right ahead and make a record and you are going to be proud of the record.

Mr. OSMERS. I am sure we will.

The CHAIRMAN. Mr. Sisk.

Mr. SISK. Senator, I am very happy to join with the others in commending you on an excellent and a well-thought-out statement here.

Senator KEATING. Thank you very much.

Mr. SISK. I think it is certainly in line with the contribution you made to our committee last year, and I am hopeful that your service is as pleasant over on the other side.

Senator KEATING. I must say I would be delighted to be a member of the comparable Senate committee. One of my regrets about leaving the House—and I am very serious about this—when it became a debating subject in my mind about what to do, one of the most fascinating and interesting phases of my activity here was in the committee that was chairmaned by our distinguished majority leader. I really hated to give that up because I thought I would have a pretty good chance of getting on this committee in the next sesssion. I knew I had no chance on the other side. So I envy you in being a member of a committee like this.

Mr. SISK. Senator, just one question I would like to discuss with you for a moment. It is my understanding that you feel that this question of a determination of policy regarding space law and the laws concerning its use is a very important question.

Senator KEATING. Very important.

Mr. SISK. Just a few days ago we had before this committee a rather high official, and I was a little bit concerned with a statement he made in answer to some questions that I asked, in which he indicated he felt there was too much discussion about this particular problem of space law and rights in space, that it was his feeling that we had more to lose, as against Russia having the same to gain, by getting involved in this whole thing.

I drew the conclusion—and I might say frankly this was Mr. Roy Johnson with ARPA, and there is no criticism of Mr. Johnson, but at the same time I had a feeling that there are people who think that if we don't talk about the problem, that the problem will go away.

You know what I mean. I just wanted your comment on that.

Senator KEATING. My views as expressed in this statement are not in complete accord with the views of the administration—at least not as may have been expressed to me. Insofar as those views have been formulated, they have the feeling—and they may know more about it than I do—that we should move very slowly in this field.

From what I know, I do not agree. I think we should move with expedition.

Mr. SISK. I appreciate your statement, and I hope certainly, Senator, you understand I am not attempting to put any partisanship implications on this.

Senator KEATING. I know you are not.

Mr. SISK. In fact, it was the first time I had even heard this thought expressed at all. I am not now aware of whether Mr. Johnson's own position represents that of other people in the administration, or whether it is his personal feeling.

Senator KEATING. I would recommend that you call before you for a discussion of this a very distinguished lawyer, Loftus Becker, the counsel for the Department of State, whose views do not coincide

with mine in all particulars, but who can present to you a forceful statement with regard to what he thinks we should do in this field. I think it would be helpful to you to hear him.

Mr. SISK. I remember Mr. Becker was before our committee last year on this same subject.

Senator KEATING. Yes, he was.

Mr. SISK. To some extent, I have a similar question. I am inclined, frankly, to agree with you, Senator, that I think it is something we should move on as expeditiously as possible in an attempt to make determinations now, before we are faced with a situation where there can be very grave implications. This idea, as expressed by one of the gentlemen a little bit ago, of landing on a particular body somewhere with a flag or with a gun over your shoulder—what is going to be the situation?

It seems to be now that if we could have the international agreements, it would be so much better than to have to meet this problem later on.

Senator KEATING. It would be awfully hard after somebody lands there, whether it happens to be Russia, ourselves, or whoever it is. It is going to be very hard then to reach an agreement.

Mr. SISK. Then, too, when we come back closer to home, although still in outer space where these satellites will be circling the globe in various types of orbits, it seems to me, too, that some type of an agreement which will permit international use of this particular area—or communications satellites, or other types of satellites—would be better made now than to leave it, let's say, in an area of indecision and then suddenly have a situation develop, where some power is able to shoot down or destroy or neutralize someone else's satellite.

I agree that expeditious action, and if it can be brought about, international agreement, is necessary. Frankly for that reason, I was a little bit concerned about this statement by Mr. Johnson the other day, although I did not pursue it at that time. I just don't feel the problem is going to go away merely by not talking about it or not discussing it.

Senator KEATING. I agree with you. I have an extremely high regard for Mr. Johnson and for his views, and for the views of those who differ with me on moving ahead now. But they do not convince me.

Mr. SISK. Just one concluding question: Do you feel that we would have any less to gain in some kind of an agreement of this kind than Russia would have? Or any more to gain?

Senator KEATING. I don't know enough about our plans, nor should they be discussed in an open session if I did know, whether we are tomorrow morning going to plant a flag of our own on the moon, and whether that may be back of some of this reluctance or not, I don't know.

If it is, I disagree with the theory. I consider myself just as good an American as anyone else, but I don't think it is in the interests of humanity or in the broadest interests of our own country to try to gain a domination over the terrestrial bodies at the expense of other nations.

Mr. SISK. Thank you, Senator. I am very happy to have you with us.

The CHAIRMAN. Mr. McCormack?

Mr. MCCORMACK. Senator Keating, as chairman of the select committee of the last session, I am very glad to see you before this committee this session. I am very proud of the work done by the select committee and of the contributions made by all members, and that particularly applies to you because you were one of the most valuable members of the select committee.

Senator KEATING. Thank you very much.

Mr. MCCORMACK. Coming down to earth, I would like to ask you a few questions. I consider you to be one of the ablest lawyers I have ever met. As I understand the law——

Senator KEATING. I had better watch out now.

Mr. MCCORMACK. As I understand our law, the law of civilized nations, if a person owns a piece of land in fee simple and there is no way to get in or out, egress or ingress, and they have to make arrangements with their neighbors who own the adjoining land in fee simple, such a person owning land so isolated could go to the courts and get an easement, on the ground of public policy, is that right?

Senator KEATING. I think in general that is so.

Mr. MCCORMACK. In other words, courts have held, as I remember, it is against public policy for the ownership of private land where the owner of it cannot get into it or out of it.

Senator KEATING. He can get what is sometimes called an easement by necessity.

Mr. MCCORMACK. We have a situation where West Berlin is so situated in the world. There might be an interesting parallel there, might there not, on an international level?

Senator KEATING. Yes; except we have an agreement——

Mr. MCCORMACK. Suppose they block us?

Senator KEATING. If they block it, then they are breaking their agreement.

Mr. MCCORMACK. All right. We have some grounds to explore on the earth about extending international law in respects like that, haven't we?

Senator KEATING. Yes; international law on earth is not an exact science the way the law of Massachusetts or New York is, which is inexact enough. But if they blocked us or blocked access there, they would be breaking a recognized international agreement. Most every nation recognizes the possibility of entering into agreements with other nations which are binding.

Mr. MCCORMACK. Should there be some place where, in such a situation as that, they could go to get an easement?

Senator KEATING. I feel in the International Court of Justice——

Mr. MCCORMACK. You hit the nail I had in mind on the head.

Senator KEATING. The jurisdiction of that is perhaps too narrow and should be extended. I would think that such a dispute would be an appropriate matter.

Mr. MCCORMACK. I am just exploring, and I want it understood for the record that any questions I ask don't represent a fixed opinion on my part or any answers you give don't represent a fixed opinion on your part. But by a parity of reasoning, it seems that there could be some steps taken to have this question raised on the international legal level, and as you said, the place indicated to your mind—just

giving an immediate reaction without a firm conviction at this time—would be the International Court of Justice.

Senator KEATING. That's right.

Mr. MCCORMACK. I am glad to hear that because that is the reason I asked the question. My mind was going along in the same direction. We haven't used the International Court of Justice, which is on the legal level, as much as we probably could. I am not saying the United States, but other countries.

Senator KEATING. It only has a very few cases. It is not used as much as it might be. I don't know whether Russia is a party to the establishment of the International Court of Justice. I am inclined to think it is not. So if it is not, I suppose it would not recognize any jurisdiction in that body.

Someone may be better informed than I on that subject.

Mr. SISK. Would the gentleman yield there?

The CHAIRMAN. Will the gentleman yield?

Mr. MCCORMACK. Yes.

Mr. SISK. I was quite interested in that particular thought that was brought up by Mr. McCormack. It recalled to me an instance I knew of at one time. I am wondering if you would agree with me that it is an equitable comparison with reference to the rights of egress and ingress into property.

I happen to know this incident happened, where for many years people had gone in and out by crossing certain fences and through certain gates to get in and out of a piece of ranch property.

A new owner came along and he nailed up the fence. The fellow came along and cut the fence. He went back and built another one. Then they began to bring up reinforcements. Then the court stepped in. Of course here is a case similar in a sense. The only thing different was that in this case, the court was able to produce enough power of the State to force the settlement, even though several people were dead already, having shot each other over this particular fence, this egress and ingress.

The court had the power, through the power of the State, to enforce its decree, whereas this International Court of Justice, which I think would be an excellent thing, has no power; even though Russia is a party to it, it has no power to enforce its decree.

I am curious to know if that is a comparison.

Senator KEATING. That is right, there is no marshal or sheriff connected with it. If they make a decision, they have no enforcement powers so far as I understand. I don't know of any case where they made a decision which has not been adhered to.

Mr. MCCORMACK. There is public opinion, too, which plays an important part. When you get it out of the strictly political level, the juridical level, there are different influences operating. Without a fixed thought, I wanted to get your views, with the record again showing that they are not your fixed views and they are not my fixed views.

But I was interested that that being the law of civilized nations, whoever they are, that certainly it could be explored on an international level, particularly in view of the immediate situation.

Mr. FULTON. Will you yield?

Mr. MCCORMACK. I am all through. I will yield.

Mr. FULTON. I think the trouble with the United States on the International Court of Justice level is that our record has not been good on obeying the decision. Likewise, when they established the Pan American Court of Justice, it was we of the United States, just before 1917, who wrecked it by refusing to go along with the decisions.

Secondly, I don't believe that Russia and its present government is a party to the Court and it would not be bound by its decisions.

Senator KEATING. The United States is a party, isn't it?

Mr. FULTON. We are a party.

Senator KEATING. We have had judges on it—U.S. nationals, who have been judges of the Court.

Mr. FULTON. When there was an opinion against us on the Pan American business, we just didn't want to go along with it.

The CHAIRMAN. Furthermore, unless all parties would agree to go in and beforehand agree to leave the means of ingress and egress open, Berlin would be starved out before the Court got around to decide the matter. Isn't that true?

Senator KEATING. That is probably true, unless we got it started long before any impasse came.

The CHAIRMAN. You would have to have another agreement in order to go in. Otherwise Berlin would be starved out.

Senator KEATING. That is true. I don't necessarily accept this May 27 deadline as anything put out except for trading purposes or as part of the war of nerves.

The CHAIRMAN. Mr. Quigley.

Mr. QUIGLEY. Mr. Chairman, I would just like to join with my colleagues in extending greetings to our former colleague and congratulate him on his most provocative statement here today. It was my pleasure to serve with the Senator as a member of the judiciary and to serve with him on the same subcommittees. I know what a grand and stellar contribution he made there.

If I were wise, probably I would not inject myself into this great debate between my colleague from Pennsylvania and the Senator from New York on the question of the inverted cone. But I would like to throw my great weight of scientific ignorance on your side of the debate.

Senator KEATING. Thank you very much. I need help from all sides.

Mr. QUIGLEY. I think the difference between you is that you are each using a different benchmark. The gentleman from Pennsylvania is drawing his line from the core, from the center of the earth. The Senator from New York, as I understood his statement and his remarks, is drawing his line from a benchmark on the surface of the earth. I think if that is the point from where the line is drawn, the overlapping which you envision has to happen.

Mr. FULTON. Could I ask you: Where does the gentleman from New York's line terminate? Suppose you extend your line from the surface of the earth toward the center of the earth, where does it go? Does it pass through the center of the earth?

Senator KEATING. I am extending it upstairs from the end of Long Island right up into the sky.

Mr. FULTON. But where does it terminate on the other end extended?

Senator KEATING. Down underneath?

Mr. FULTON. Yes. Does it pass through the center of the earth?

Senator KEATING. I am not extending it down there at all.

Mr. QUIGLEY. And I would point out anyone who wanted to make this argument would not extend it in that direction either. They would only go up. You are being logical, but I think the people who would raise this problem would draw the line just the way you have drawn it—from a point on Long Island to a point two miles out of Moscow or something like that.

Mr. FULTON. If you run it straight up, you are going to get a space between two perpendicular lines if they are perpendicular to the surface of a curve. Then you get a space. You don't overlap. You get a space.

Mr. QUIGLEY. You will get both. You will get gaps at certain altitudes and overlappings at others.

I have just one question, Mr. Chairman.

The CHAIRMAN. I hope we can finish this witness by noon.

Mr. QUIGLEY. I have one question. Senator, without questioning your basic premise about the desirability, the need, perhaps even the very necessity of the early establishment of certain internationally accepted basic legal concepts in the law of space, without questioning the desirability or the necessity, in the light of the progress we have failed to make in the field of atomic energy, aren't you pretty discouraged?

Senator KEATING. I never allow myself to get discouraged. I am not optimistic about early agreement. I recognize fully the great difficulties involved, but I think we should do everything conceivable within our power to try to reach such an agreement. I am not discouraged from trying to do it because of the difficulties which we have encountered in reaching an agreement on the high seas, on atomic energy, and the terminating of nuclear tests and all of these other things which we have been trying to reach an agreement on with the rather intransigent countries that we have to deal with.

Mr. QUIGLEY. One final question: In the light of the overall situation, is there anything that you believe this committee or this Congress could do that would start the ball rolling or at least give it a gentle push?

Senator KEATING. Yes. I think this committee in its recommendations—I don't know that I think of actual legislation—I don't say there isn't legislation—perhaps something in the nature of a consensus or Congress resolution would be appropriate.

But certainly in its recommendations, I would hope that this committee would take the position that it is imperative we reach an agreement. I would hope they would be in sympathy with the general principles enunciated in those three points, and that they would say the quicker we get at this, the better, and lend the weight of the opinion of this committee to that process.

Mr. QUIGLEY. Thank you.

The CHAIRMAN. Mr. Wolf?

Mr. WOLF. Thank you, Mr. Chairman.

Senator Keating, I thought you might like to know that the Des Moines Register, that great cornfield newspaper in the Middle West, had an editorial endorsing your position on December 28, 1958.

Senator KEATING. That is very nice of them. You must have quite a research——

Mr. WOLF. I am kidding, of course. But in all seriousness, Mr. Chairman, I would like to have this made a part of the record if I could.

The CHAIRMAN. If there is no objection, it is so ordered.

(The document referred to is as follows:)

LAW FOR OUTER SPACE NEEDED

(Extension of remarks of Hon. Leonard G. Wolf, of Iowa, in the House of Representatives, Monday, March 2, 1959)

Mr. WOLF. Mr. Speaker, the Des Moines Register of December 28, 1958, carried an excellent editorial pointing up the urgent need for the adoption through international agreements of space laws to settle questions of ownership and to govern traffic in outer space. The Des Moines Register is to be commended for its farsightedness in this connection. The editorial, which follows, is even more timely today than when it was written 6 weeks ago:

"LAW FOR OUTER SPACE NEEDED

"Who owns outer space? Who makes the law there? Since sputnik, these are no longer theoretical questions but highly practical ones.

"Sputnik, by circling the globe in less than 2 hours, and traversing practically every country in the world repeatedly, vaporized the early hypothesis that each nation owned and had jurisdiction over its airspace—at least as high as man-made devices could fly.

"Long-distance missiles, meanwhile, vaporized the other chief hypothesis, that the higher air (and nonair) was like the high seas—open to all as a matter of right.

"Bright young law students have been filling the law journals with ideas on the subject, and responsible statesmen and scientists have been prayerfully considering it.

"A staff report for the Committee on Astronautics and Space Exploration of the U.S. House of Representatives recently called for advance notice of flight plans of satellites and missiles so they would not be mistaken for a hostile missile attack and trigger an accidental war.

"The staff report discussed the legal theories advanced so far and urged creating some space law by international agreement. It suggested starting cautiously with the most pressing problems: restriction to peaceful uses; defining that term carefully: settling the liability for reentry accidents; and the ownership of reentering spacecraft.

"President Eisenhower's recorded peace message from the 4-ton Atlas satellite is a dramatic reminder of the U.S. Government's willingness to get started."

Mr. WOLF. I would like to say the key to your statement is the necessity for new laws and concepts, and in this case they say laws through international agreement are overwhelmingly necessary. So you see they agreed pretty well. I just thought you would like to know.

Senator KEATING. I appreciate that. I am glad to have such stanch support.

Mr. WOLF. As my colleague from New Jersey spoke, I have just written down this thought. I hope we don't run into conflicts with people who may be living in outer space right now. They may have our world all divided up when we get out there.

This is just a thought. While you might think it is in a humorous vein, while there seems to be overwhelming support that there is no life, there have been some pretty intelligent appraisals of why there might be life in outer space.

Senator KEATING. Yes; there have. I would say that there is strong opinion that there is some form of life. But anything as advanced as

human life seems to be pretty well discounted. Who knows? Someday we will know. I expect to know before I am required to leave this earth. I expect to know that.

Mr. WOLF. The other question, Senator, that I was wondering about, and anyone here can answer this: Has there been any proof that the Soviet Union has shown any willingness to cooperate with us on the law of outer space? And if they have, I think we have discussed the question of their lack of morality in international law, but have they even indicated any desire?

Senator KEATING. I don't think there has been any strong indication of it, at least. We have encountered difficulty in the United Nations in going into the subject. There has been a proposal by the study committee which they have been unwilling to go along with.

You put your finger, as have others, on the biggest stumbling block to progress, I would think—which is their attitude. Let us not permit that to deter us from moving ahead. My feeling is that if the great force of world opinion becomes strong enough, they may be compelled to go along with some program. Then comes the question how much faith can we put in their agreements.

I suppose we are always going to have in the whole history of civilization some nations that are not disposed to live up to their agreements. Whether we will have to have enforcement machinery or not up in outer space, too, and set up a marshall's office up there, is another subject to be taken up.

Mr. WOLF. Thank you, Senator. I didn't want to belabor that point but I still think it is a very important point. No question about it.

The CHAIRMAN. Mr. Moeller.

Mr. MOELLER. No questions.

The CHAIRMAN. Mr. Daddario.

Mr. DADDARIO. Senator, do you carry your analogy to the Joint Atomic Committee to the point where you would also create, over and above this whole proposition (to get rid of these problems which are before us), an agency with jurisdiction over the space and missile age comparable to the Atomic Energy Commission? Do you think that also is an answer, to carry it a step through the Congress to the Atomic Energy Commission?

Senator KEATING. We have the National Aeronautics and Space Agency now created.

Mr. DADDARIO. Would you say there is the same overall control to this space problem, with all of the various defense departments, with all the military aspects to it? Certainly it is not the same thing.

Senator KEATING. In formulating the legislation for the creation of the National Aeronautics and Space Agency, we had a great deal of testimony about what the Atomic Energy Commission did, and patterned our Agency in part after them. We drew on that experience, and undoubtedly the legislation creating this Agency will have to be amended from time to time.

There is a very great problem over jurisdiction between the military and this civilian Agency. We encountered that when we drew our legislation. We thought we were taking care of it. But it may be necessary to amend that legislation to more definitely define where the eventual authority is.

I think we had the feeling that if there was a real conflict in a particular development as to whether it should be handled by the Agency or by the military, that would have to be resolved by the President.

Perhaps the Agency should have more authority than it has, or perhaps the military should. You see, we had quite a hassle over just how to word the language of that bill. There were strong representations made to us by the military that they shouldn't be interfered with in their requirements in outer space, and we were all sympathetic to that.

Still we didn't want to set up a shell that had no authority at all. I presume the chairman and all the members would agree that we have got to keep constantly under surveillance that legislation, and the Agency that we created in it, to be sure that this whole field is functioning properly.

Mr. DADDARIO. Senator, then just to one other point. In your approach to the legal aspect of this, it seems to me that one of the premises you spring from is the fact that there is really nothing up there now, and this is a good time to start, while there is no conflict and to avoid that conflict which might otherwise come.

Senator KEATING. Well, there are a lot of things flying around up there now, indefinitely. But there has been no landing on a celestial body or anything of that kind. Every time any nation makes an advance up there, I think it becomes increasingly difficult to reach an agreement for the future.

Mr. DADDARIO. What you are proposing is a step which will take care of that problem when it arises?

Senator KEATING. Yes, and to try to reach that agreement before the problem arises, rather than after, when one side would have an advantage which they might see fit to press.

Mr. DADDARIO. I don't want to get into the argument with Mr. Fulton either, but at one time there was a theory that parallel lines did in fact meet in infinity. I think Einstein's theory somewhere along the line includes this kind of thought.

The CHAIRMAN. The Chair will appoint a special subcommittee to determine that point.

Mr. FULTON. Let's ask your physicist. From the center of the earth would the point of reference of cones overlap any place in finite space?

Mr. DADDARIO. They say two plus two equals four to everybody except physicists, though.

The CHAIRMAN. Let's work that out as our homework. We will be glad to have the final answer.

Senator KEATING. Members of the fourth estate might be able to help you.

The CHAIRMAN. We are very happy to have you here this morning. You have made, as you can see, a very glamorous and interesting witness.

Senator KEATING. Thank you very much.

The CHAIRMAN. In fact this is homecoming day, by the way.

Senator KEATING. I have enjoyed it.

The CHAIRMAN. We are pleased to have you.

I want to say to the committee: We have two other very capable, interesting and informative witnesses. We have Frederick C. Durant,

III, executive assistant to the vice president for Research, Avco, and former president of the American Rocket Society, and former president of the International Astronautical Federation; and then we have our former counsel and former director of the select committee, George J. Feldman, attorney, who both will be here this afternoon.

The Chair thought this afternoon he could begin at the bottom and go on up to give members at the bottom of the committee a better chance.

So Mr. Wolf, be on hand early this afternoon.

If there is no other business, then, we will adjourn until 2:30 this afternoon.

(Whereupon, at 12 noon the committee was recessed, to reconvene at 2:30 p.m.)

AFTERNOON SESSION

The committee met at 2:30 p.m. in the Veterans Affairs Committee Room, Old House Office Building, Hon. Overton Brooks (chairman) presiding.

Present: Representatives Brooks, Fulton, Miller, McDonough, Sisk, Karth, Daddario, Moeller, and King.

The CHAIRMAN. The committee will come to order.

This afternoon we have a real treat for us here. We have back with us on this, the committee homecoming day, the former director and chief counsel of the committee, George J. Feldman, of New York.

We invited Mr. Feldman to come back here, since we knew of his reputation as a lawyer and as a man who has dealt with this subject and helped in many matters in reference to Congress and controversies throughout the country. We invited him to come back and testify.

This afternoon we will begin at the other end of the committee with Mr. King.

Do you have a prepared statement, Mr. Feldman?

STATEMENT OF GEORGE J. FELDMAN, FORMER DIRECTOR AND CHIEF COUNSEL, SELECT COMMITTEE ON ASTRONAUTICS AND SPACE EXPLORATION

Mr. FELDMAN. Yes; I do.

The CHAIRMAN. Will you proceed with your prepared statement.

Mr. FELDMAN. Mr. Chairman, I want to thank you for this opportunity. I also want the record to show that I am not unaware of my own ignorance on this subject. The longer I live with it, the more sure I am of that.

Mr. FULTON. May I welcome you to the committee and say that we have every confidence in your judgment and we know that you will be able to contribute a lot to our consideration of the subject of the law of outer space.

Mr. FELDMAN. Thank you, Congressmen.

Although the National Aeronautics and Space Administration was not given regulatory powers, the House and Senate committees contemplated that it would conduct research with a view to domestic legislation and that it would also participate directly in studies and proposals for international agreements governing the use of outer space.

Section 205 of the act expressly authorizes the Space Administration to "engage in a program of international cooperation in work done pursuant to this Act."

In addition, the act authorizes the Administration to engage in "the establishment of long-range studies of the potential benefits to be gained from, the opportunities for, and the problems involved in the utilization of aeronautical and space activities for peaceful and scientific purposes."

This language seems broad enough and was doubtless intended to include the legal problems of space.

The need for the positive pursuit of international agreement on uses of outer space is clear. I think Senator Keating made that abundantly clear this morning.

It is spelled out at some length in the comprehensive and authoritative "Survey of Space Law," issued as a committee print and later as a House document by the select committee.

Today this need is emphasized by the legal uncertainties which have arisen with the expiration of the International Geophysical Year. It is becoming increasingly urgent with the passage of time in view of the increasing space capabilities not only of the United States and the Soviet Union but of Great Britain and soon other nations as well.

Every member of this committee is fully aware of the military potentialities of missiles, satellites, and space vehicles and the risks of wrongly identifying objects moving through space. There is a danger that delay in establishing international space law may make later efforts increasingly difficult.

The positive law of outer space can be quickly summarized. Space flight is not expressly governed by existing international law. Most writers on the law of outer space have taken the position that the definition of "aircraft" contained in the Chicago Convention, which is the only generally accepted international flight agreement, does not apply to space vehicles.

If I may just allude to what that convention said, I think it may be helpful, although I believe many of you know this. Article I of the Chicago Convention provides that every state has complete and exclusive jurisdiction over the airspace above its territory. But the convention contains no definition of the term "airspace" or of any equivalent term such as "air" or "atmosphere."

In later annexes to the Chicago Convention, the related term "aircraft" is defined in language adopted from the Paris Convention in 1919 as "Any machine which can derive support in the atmosphere from the reactions of the air."

So we see that this definition does not fit the term "airspace." The failure of nations to object to the passage of satellites above their territories, from the launching of sputnik I in 1957 until the end of 1958, has been explained as due to an implied international agreement based on the acquiescence of other governments in the announcement made by the United States and the Soviet Union that satellites would be launched in connection with the International Geophysical Year.

I have repeatedly urged that this temporary and limited agreement be broadened into a magna carta for outer space. Such a broadening appears desirable, even necessary, both for reasons of national security and in order to establish reasonable uniformity in such matters as navigational aids and radio frequencies.

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I know that many influential voices have been raised in the executive branch against any early, comprehensive, and explicit agreement. It seems to me, however, that none of the arguments which have been offered in opposition to a comprehensive code of space law would have any convincing application to limited agreements on the uses of outer space.

Before expressing my personal views as to the kinds of limited international agreement which should be sought in the near future, I should like to review briefly the present status of studies and negotiations looking toward the international legal control of outer space.

Last November 13 our Ambassador to the United Nations, Henry Cabot Lodge, introduced in the General Assembly a resolution recommending space studies in four fields. One of these fields was described in the resolution as "the nature of legal problems which may arise in the carrying out of programs to explore outer space."

This resolution was approved by the General Assembly on December 12, 1958. Unfortunately, the establishment of a study committee to carry out the resolution has proceeded very slowly. I would say at a snail's pace.

Owing to a dispute over the membership of the study committee, the Soviet Union and other bloc countries have refused to participate. To the best of my knowledge no United States delegates or advisers have yet been appointed. It would seem to me to be a matter of interest to this committee, and well within its jurisdiction, to inquire what steps have been taken or planned by the United States in participating in the work of this United Nations study committee.

I understand from what Senator Keating stated this morning that Loftus Becker may appear before this committee. It might be well for this committee to try to determine from him what the status of our position is with respect to implementing this resolution.

I should like to remind you also that section 201 of the Space Act established a National Aeronautics and Space Council, chaired by the President. One of the stated functions of the Council is to develop a comprehensive program of aeronautical and space activities to be carried out by the United States Government.

Under this provision it would seem appropriate for the Council to consider and formulate a statement of the United States position on international collaboration in outer space, for presentation at the proper time in the United Nations study committee.

While the proceedings of the Council are naturally kept secret, testimony given to this committee by administration witnesses indicates that this subject has never been placed on the Council agenda.

A number of limited international agreements on the use of outer space have been proposed from time to time. At the 1958 Congress of the International Astronautical Federation I urged the continuation of the International Geophysical Year. Unfortunately, the IGY expired on December 31, 1958, and the arrangements for international scientific cooperation which took place under its auspices have continued on a very limited basis. It should be possible, to a greater extent than in the past, to exchange tracking data and navigational and signal codes. I think this was commented upon by a previous witness, Andrew Haley.

In particular, international agreements must be made on radio frequencies for satellite and other space communications. I understand

that testimony on this subject has been heard by this committee in the past few days. Some international space projects, such as relay or postal satellites or missiles, could be undertaken jointly by several nations or under the aegis of the United Nations or some other international organization.

I would like to repeat also what Senator Keating said this morning, that some Soviet legal writers themselves have suggested that international agreements would be possible and desirable on the identification of satellites and on liability for injuries or damage caused by manmade objects falling from space.

The final step would be advance notice and coordination of launching schedules. The risks which may arise from the launching of new spacecraft where no notice is given of the launching are apparent to everyone. Ideally, prior notice of launchings should include information on flight plans and on the contents and proposed activities of the satellites or space vehicles. While this should be the ultimate objective, it is doubtless not immediately attainable because of the well-known views of the Soviet Government on the issue of international inspection.

Going beyond particular international agreements to general principles, I would urge this committee to adhere publicly, as the select committee did, to the twin principles of freedom of outer space for nonexclusive peaceful purposes and the prohibition of hostile activities, including the use of atomic and nuclear warheads.

The administration has also concurred in these principles, judging from public statements made by the President and by the Legal Adviser of the Department of State.

Finally, how can this committee help to establish a rule of law in outer space? I suggest that it can help mainly by the vigilant performance of its watchdog functions over the National Aeronautics and Space Council and the international cooperation activities of the NASA and other executive agencies.

It is also important for committee members and staff to participate in the space law organizations and activities of the Federal Bar Association, the American Rocket Society, the International Astronautical Federation, the American Bar Association, and similar groups.

Such participation will not only keep the committee informed of developments and other points of view but will give these private organizations a much-needed feeling of official interest and encouragement.

In particular, I am gratified to learn that a subcommittee, chaired by Congressman Anfuso and composed of several members of this committee, will attend the March 20 meeting on space law and sociology to be held in New York by the American Rocket Society.

I should be happy to answer any questions members of the committee may have.

The CHAIRMAN. We certainly thank you for a very fine statement. I would like to ask you one or two questions, but I am going to save my questions until last. In accordance with our policy, at this time we will call on the junior member of the committee, Mr. King, for any questions.

Mr. KING. Mr. Feldman, I have enjoyed this statement very much. We have heard testimony from yourself and others to the effect that a tremendous job must be done in defining rights in outer space. At

present it is chaotic. Nobody is certain what rights exist, who owns the satellites, who has the right to control them—all of these related problems. Then when we get to the moon, the problem there of territorial control, and so on.

You have suggested in your presentation that the matter has come before the United Nations, that there was a resolution that a committee be appointed there; but that the thing has bogged down for political reasons—that is, Russia dragging her feet, as she has done so often.

My question is: How can this ice jam start to move? Everybody says something must be done; the thing must be defined; we must get together by international agreement and define these things.

Yet the one agency which is set up to do that—the United Nations—apparently is bogging down. And if Russia is running true to form, that may go on for years and years and years.

I would like to know what specific steps, concrete immediate steps, can be taken by Congress, by this committee, by NASA, or any other interested agency, to get this thing moving right now.

Mr. FELDMAN. In other words, you want to find out how to get an international agreement into orbit, so to speak.

Mr. KING. That's it. What steps can be taken right now—at least one step forward?

Mr. FELDMAN. I think we made an admirable start by sponsoring the resolution, to begin with. But there is no need to wait for Russia to join this group. The ad hoc committee could go ahead and begin operating, make these studies. They are not doing that. It would seem, if this continues, that we might be accused of having just introduced this resolution and started the movement for window dressing purposes.

I think there is no need of waiting on Russia or her satellite countries to join us because if the pattern runs true, if you start a working organization which begins to operate and do things, the Russians will join. They have done that in the past.

A recent illustration of what I am talking about happened in the Antarctic, when Russia was standing off and was going to act by herself and make claims all alone and so on. The rest of the countries in Antarctica decided that they would stand together and say that all areas down there belonged to everyone. Then Russia, by virtue of public opinion and because they started this thing, came along.

So I say the first thing to do is get the ad hoc committee on the road.

Mr. KING. Suppose Congress were to memorialize the State Department to instruct our delegates to the United Nations to insist that the committee get organized. Would that be a concrete step?

Mr. FELDMAN. That would be. But I think the first thing to do would be to question Loftus Becker when he appears here tomorrow and determine exactly what is being done. I imagine they are doing something in connection with it because we have made a commitment.

Then, based upon what you find out, determine whether or not you want to memorialize State or take whatever steps are necessary to see if our Government can't push it further.

I don't think it will be necessary even to do that. Under the provisions of the law which I stated here you could have NASA implement that, or have the Space Council start such action.

Mr. KING. That is all I have, Mr. Chairman.

The CHAIRMAN. Mr. Moeller.

Mr. MOELLER. Mr. Chairman, if I could pursue this a bit further, wouldn't it be wise if our agencies here would speak with one voice? It would seem as though the United States first ought to have in its own mind certain ideas relative to space law before we would want to meet with others and discuss it, would we not?

In other words, we can't be floundering around and have divergent opinions on this, and then hope to sit down with someone else and arrive at conclusions.

Mr. FELDMAN. That's right. Policy has to be set. There is no question about that, if I understand your question correctly.

Mr. MOELLER. That's right. How would you suggest that this be implemented?

Mr. FELDMAN. You can't make such efforts work by just pressing a button and expect it to spring into existence overnight. This has to be done step by step and studied.

There are certain areas where, internationally, you could begin to cooperate immediately. There could be no question about that—the radio frequencies, the question of liability.

When it gets to the question of how far up jurisdiction goes and all that sort of thing, I think personally we are a little premature. We have too much to find out. We are still in the horse-and-buggy stage of this whole development.

While we are moving rapidly—because the sum of human knowledge doubles every 10 years now, whereas it doubled only every 50 years before—we still don't have enough information about space itself.

Mr. MOELLER. You made a suggestion before, and this may sound facetious, that this committee should serve sort of in a watchdog function over the Space Council; and in the same breath a moment before you had said pretty much of what goes on in this Council is quite secret.

How can this committee do anything about it?

Mr. FELDMAN. I was distinguishing between the Council and NASA.

Mr. MOELLER. The Council is the one that is secret?

Mr. FELDMAN. That's right.

Mr. MOELLER. We certainly couldn't serve as watchdogs of that.

Mr. FELDMAN. No; you could not because of presidential immunity; but you could of NASA; and NASA is able to and I understand has, set up some token groups within its organization to undertake studies pursuant to the act. What they have done, I don't know.

Mr. MOELLER. It wouldn't be possible that the Council would be operating along these lines independent of NASA and so forth?

Mr. FELDMAN. It could be. They have that authority. They would be the ones, I assume, because of the fact that they are on top, to set policy in this connection along with the State Department.

The CHAIRMAN. Mr. Daddario.

Mr. DADDARIO. Mr. Feldman, I have been very pleased to find out that you were coming here today because I read the hearings of the special committee, of which you were the executive director and counsel; and because of the fact we have some mutual friends in the New England area, especially in Hartford. It is a pleasure to welcome you here this afternoon.

Mr. FELDMAN. Thank you.

Mr. DADDARIO. In your report you speak a great deal about joint efforts. I wonder if in that you include joint efforts not only with those nations with whom we are generally friendly, but also the Soviet Union itself?

Mr. FELDMAN. Yes; because if—as Congressman Fulton pointed out this morning—the Soviet Union or Communist China are not members, that makes it more difficult. If everyone joins in and agrees, it makes it that much simpler.

Mr. DADDARIO. And also you stress the fact that we should keep in the forefront of the area of the peaceful uses of outer space, and the scientific developments which can result from that.

Mr. FELDMAN. That's right.

Mr. DADDARIO. In this particular area, is it your opinion that if we were to cooperate and have some kind of joint efforts with the Communist nations, that it might then give an advance into other areas of agreement as well?

Mr. FELDMAN. Conceivably, yes.

Mr. DADDARIO. During the course of the hearings we have had to date, it seems that we have reached the point where it is generally conceded that the Russians have more propulsion power than we have; and at the same time we seem to be ahead in the refinement of the electronic systems, and that in the Russian efforts they lose a lot of the payload possibilities because of more crude instruments being used within the payload of the satellites.

Do you think that in this area the use of the advances they have in propulsion and the use of the advances that we have in the electronic situation might be a good area of agreement to perform such things as a successful weather satellite, or to get to the point earlier where we could use one of these radio satellites, one of the equatorial satellites they are talking about?

Mr. FELDMAN. I won't answer your question directly yet. But one of the things that could be done, even if Russia didn't join in, is to get a group of nations that are working together and jointly put up a weather satellite and so on—to get them working as they did in the International Geophysical Year, except have their scientists work with our scientists.

If it has to be only free world nations, we should start that way and perhaps the Russians would come in. But I think the idea, basically, is a very good one.

Mr. DADDARIO. Then it would be a good psychological step, would it not, to say that this is what we would like to do and that we were inviting all nations to participate, eliminating no one?

Mr. FELDMAN. I think some such program should be undertaken.

Mr. DADDARIO. And it is the result of the benefit you have had of working together with the committee last time and the studies you have made to date, that this would be a proper step to take?

Mr. FELDMAN. I would mobilize all the brainpower possible.

Mr. DADDARIO. When you say you would mobilize all the brainpower you could get, Mr. Feldman, isn't that because if you can get scientists and you can put them together in an atmosphere where they not only work together but play together and have their recreational hours together, somehow the flow of development of experiments is speeded up in the process within this kind of environment?

Mr. FELDMAN. That is generally accepted as true.

Mr. DADDARIO. And that this advance could take place with the scientific mind, whether it be American, Russian, or what it might be?

Mr. FELDMAN. I think that Congressman Miller would be in a better position to give us some information along those lines than I would because, being an engineer by training, he has, I am sure, worked with scientists in the past and knows what makes them tick.

Mr. DADDARIO. The reason I asked you that, Mr. Feldman, is because it seems to me implicit in the statement you have made, and in those clauses which I can pick out, that there is a possibility of cooperation in the scientific uses where there cannot be any argument and where we could make great advances.

I think this is so. And, you have in here sort of directed an arrow toward the effort we can make. You should be complimented in bringing that kind of an idea into the structure of the statement you have given to the committee today.

Mr. FELDMAN. International cooperation is tremendously important in this field.

Mr. DADDARIO. Thank you, Mr. Feldman. That is all.

The CHAIRMAN. Mr. Karth.

Mr. KARTH. Mr. Feldman, I came in a little late. I think you were on page 3. I wanted to hear some interesting discussions on the floor of the House.

But I do notice on page 2 of your testimony—and I quote from it, the first part of the last paragraph: "I know that many influential voices have ben raised in the executive branch against any early, comprehensive, and explicit agreement."

Because you do know many influential voices are being heard in this line, I suppose you know who they are. I think for the record you should tell the committee who they are.

Mr. FELDMAN. Loftus Becker in his testimony before this committee last year indicated that it was too early to start any comprehensive agreement.

Mr. KARTH. Is there anyone else you have in mind, sir? You said many influential voices.

Mr. FELDMAN. No. I was assuming he was talking for the State Department.

Mr. KARTH. If this is a fact, then doesn't it appear to you——

Mr. FELDMAN. I think that John Cobb Cooper may also feel—and he is not with the administration—that it is a little premature to start anything comprehensive.

Mr. FULTON. But doesn't John Cooper feel we should be beginning studies immediately as you suggested?

Mr. FELDMAN. That is why I distinguish between comprehensive and limited. That is the point I am making. We can't make anything comprehensive yet. We would have all we could do, really, to study the limited areas in which we could operate. If we came up with something concrete in those, that would be a beginning. We have to have a beginning, and then implement it as we go along and learn more.

Mr. KARTH. What would be your opinion as to why many influential voices in the executive branch are opposed to comprehensive agreements.

Mr. FELDMAN. For the reason I previously stated. We don't know enough about outer space. We don't know——

Mr. KARTH. I was just trying to find out whether or not there was any particular significance to this one statement here, and apparently——

Mr. FELDMAN. I suggest that ignorance is possibly the biggest obstacle. We would be considering things we know too little about.

This morning, for example, we heard some discussion about the possibility of life on some of the other planets. These are highly speculative things and fine to talk about. But you couldn't sit down and begin to draft an agreement concerning such things at this point. It would be foolhardy to do it and a waste of time and effort.

Mr. KARTH. I am not questioning the point that you make now. I was just wondering whether or not you attached any specific significance to this one statement. It did strike me as a very forceful statement.

I was wondering, if you did attach significance to it and if there were reasons, other that the reason of ignorance, why influential people in the executive branch would not be in favor of this, then it would be extremely difficult for us to implement the practical space law or space agreement.

That was my point, sir.

Mr. FELDMAN. What I have mentioned is the main reason.

Mr. KARTH. Thank you. That is all.

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. In answer to one of the questions of Mr. Karth, the committee on its survey of space law—the Select Committee—on page 29 said: "While there has been a general disposition on the part of the United Nations to accept the American idea of a preparatory outer space study commission, the only attitude which all the governments appear to share is: Caution. It was perhaps in recognition of this fact that the U.S. proposal on outer space in the U.N. emphasized the policy of 'easing in' to the legal control of space."

Then the proposed study in the United Nations would have a committee made up of quite a few of the free or Western countries. But because of the dispute there would be no countries such as Soviet Russia or behind-the-Iron-Curtain countries.

Is that not right?

Mr. FELDMAN. That's right.

Mr. FULTON. So that you would recommend the General Assembly of the United Nations going ahead with the study, regardless of the fact that no one behind the Iron Curtain was represented, would you not?

Mr. FELDMAN. I would; and may I add that if the study indicated, by sheer logic, that this was for the good of mankind, then the Russians would either be subject to adverse world opinion, or they would join up—one of the two. They would be censored by public opinion or join up.

Mr. FULTON. Under subsection (d) of our resolution that was adopted in December, "The area of international cooperation of programs and the peaceful uses of outer space which would appropriately be undertaken under all auspices for the benefit of states, irrespective of the state; economic or scientific development, taking into

account all proposals; continuation on a permanent basis of the outer space research now being carried on within the framework of the International Geophysical Year"—which is what you would recommend?

Mr. FELDMAN. That's right.

Mr. FULTON. Likewise, the international cooperation is strongly recommended, is it not?

Mr. FELDMAN. That's right.

Mr. FULTON. Then the organization and the mutual exchange and dissemination of information on outer space research was another matter that you have been very interested in and is also recommended in our U.N. resolution. Is that not right?

Mr. FELDMAN. Yes.

Mr. FULTON. Then the coordination of national research programs for the study of outer space and the rendering of all possible assistance and help toward their realization. That fits in, too, as a purpose with your idea of getting together on maybe a weather or a communications satellite, does it not?

Mr. FELDMAN. That's right.

Mr. FULTON. Then could we comment, too, that we not only need the appointment of the people on the proposed representative committee for the United States, but we should have representations to other countries to get moving in the same direction, should we not?

Mr. FELDMAN. Yes, and to enlist the support of scientists in these other countries. They have many good scientists.

Mr. FULTON. We have, as you know, under the act creating space activities, authorizations for the Space Council under the chairmanship of the President, as you pointed out in your statement. The Council is being filled by members being appointed, but to date there has been no appointment of the administrative officers nor the staff of that Council. There has been one man on loan as a temporary administrative officer, but actually no permanent organization as yet.

Would you recommend that this committee likewise try to speed up the formation of that organization, which as you have adequately pointed out, is a policy-forming body?

Mr. FELDMAN. Yes, and one that could really assist the Council in setting up its own agenda instead of operating on a relatively hit-and-miss basis.

Mr. FULTON. So that until the Council does act in setting a national space policy as to our method of development and progress in that field, which covers both military and civilian, and both of which are represented on the Council at this high level—until that is done, we really have no firm, high-level policy direction in this field, of the U.S. Government or people, do we?

Mr. FELDMAN. I don't know of any that exists.

Mr. FULTON. That would clear up quite a bit of the trouble on what direction we are to take overall on a space policy, and would in many cases settle a lot of the jurisdictional questions between the military and the civilian uses of space, would it not?

Mr. FELDMAN. That's right.

Mr. FULTON. May I congratulate you again on your appearance before the International Astronautical Federation in The Hague, and Amsterdam, where you gave a paper on space law. You were very

well received and some of us were very pleased to have been able to be there to hear you give your report on space.

As a mater of fact, I have liked your statement today so well I am putting it in the appendix of the Record so it will get a lot of circulation.

I will finish with this and I am through.

When we set up the Space Act, we looked ahead to great enthusiasm and vast development because we knew it affected the security of the United States of America and our people if we lagged in space development.

Can you recommend to the committee further ways that we can awaken the public and the U.S. Government to the real needs of moving in this field?

Mr. FELDMAN. I think what the committee is doing by holding these hearings is having that kind of an effect—awakening various groups to the need to cooperate rather than compete to the point where progress is prevented.

Mr. FULTON. Could I just finish, too, with the question of where you put the limits of U.S. sovereignty in space, or of any nation, for that matter? Do you put it on a basis of the control of space, or tie it to a certain area? Or do you put it on the Van Karman line, or do you put it on the question of where Kepler's law of the stellar body takes over? Or do you put it, say, where the tenable atmosphere ceases or where aerodynamic flight and lift ceases?

How do you gage the point, the limit, of sovereignty?

Mr. FELDMAN. I don't gage that point at all. I don't think there is any limit. I don't think we can define it at this time. It is one of the things we have to study and wait for time to help us find out what it is all about.

Mr. FULTON. One of the recent satellites has its perigee at 143 miles above the earth's surface. There has been no complaint by any nation on that. Would that seem to bring down this space floor to within 143 miles of the earth's surface simply because of the fact there has been a practice that has not been opposed to?

Mr. FELDMAN. No, I don't think so. I think the emphasis belongs more on this: what could anybody do about it at this point?

Mr. FULTON. It is a lack of the power to control rather than the fact that there is any particular scientific or legal limit on sovereignty?

Mr. FELDMAN. That is the state of the art at the moment, in my opinion.

Mr. FULTON. Suppose we knew the Russians or some possible enemy was going to put a million tons of TNT in a satellite in the air that was going to come within 100 miles of where the X–15 could be flying. Would we say that is under the Paris Convention of 1919?

Mr. FELDMAN. I don't say any satellite comes under the Paris Convention of 1919.

Mr. FULTON. Even though it is within the place where we could actually be flying an advanced plane?

Mr. FELDMAN. I would say that was an act of law.

Mr. FULTON. Thank you. It is very interesting. I have enjoyed it a great deal.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. Following my good friend over here, Mr. Fulton, who tries to define these places, isn't it a good deal like, and aren't we in the same position as, the Spanish in California in the early days when they used to grant a man a title to land in the valley that was defined between two rivers, and then say "on the west by the snowy mountains"?

Mr. FELDMAN. I think that is as good an analogy as I have heard.

Mr. MILLER. In other words, where the snowy mountains are. We know they are out there. They were just as far away as space today is.

Mr. FELDMAN. We don't yet know how high "up" is. We are dealing with that kind of vagueness.

Mr. MILLER. When Congress passed the act setting up the Council or the Space Agency, they provided for this Council. Isn't it true that there is very little we can do until that Council acts? It is really their function.

Mr. FELDMAN. Well, I wouldn't say that in the light of public opinion, which is pretty telling.

Mr. MILLER. There is only one more question. You are as knowledgeable as any man in this field. We have had a term or word introduced here—aerospace. What does that mean?

Mr. FELDMAN. That is a label, and you can't, by fiat, simply say that something is aerospace and mean that it starts from the ground and goes up to infinity, because—and you don't have to be a scientist to know it—there is as much difference between aeronautics and astronautics as there is between day and night.

You can't take somebody who made carriages in the early days and say "You are going to build automobiles tomorrow." You can't do that. You can't take people trained in the making of automobiles, engineers who know what makes an automobile operate, and tell them to build an airplane.

I also say you can't take those who are trained in aerodynamics and make space experts of them by fiat, or legislation, or declaration.

Mr. MILLER. Or the use of a catch phrase that has no real meaning.

Mr. FELDMAN. That's right. One of the difficulties, as I see it—and I could be all wrong—is that the scientists in this field are few and far between. But we have them. They are here. One of the dangers that we may run into is the fact that somebody who is not qualified to understand what they are talking about is trying to evaluate what they are doing. You would recognize that better than anyone on the committee.

Mr. MILLER. I am thinking about these things. I go back to the time when my father was an engineer and they first started the application of gas engines to tractors. You had to have an engineer to run them to do what every kid can do today as far as the gas engine is concerned.

That has taken place within 50 years. So these people who are going into this field are in the same position, for instance, as the people who took the first steamboat across the ocean in their relation to the sailor of today.

Today we don't look upon it as a great thing—for a trained man to handle the steam engines on a ship. But then, this is 1959 and not 1832. Right?

Mr. FELDMAN. Yes. I am reminded of a statement that Admiral Hayward made to us one day. His father was one of the pioneers who worked with the Wright brothers. He told me that he remembered, as a youngster, going out to the field and spending all day long in the hope that maybe the plane would go up.

That corresponds to our situation today.

Mr. MILLER. I would just like to say that I join in thanking the gentleman for the very fine contribution he has made in the past, and his continued interest in this field.

The CHAIRMAN. Mr. Feldman, I have a few questions that Mr. Anfuso asked me to present to you. The first question is: It is your opinion, is it not, that the language of the Space Act is broad enough to include the legal problems of space?

Mr. FELDMAN. There is no question about that in my mind.

The CHAIRMAN. In your opinion is the development of space law and foreign policy ahead of the space program in general, or is it lagging behind it?

Mr. FELDMAN. I would say it was lagging considerably.

The CHAIRMAN. Behind the development of space?

Mr. FELDMAN. Much behind it.

The CHAIRMAN. Can you propose possible courses of action for the U.S. Government to follow, and this committee, with respect to such private organizations as the American Bar Association, the American Rocket Society, the International Astronautical Federation, and so forth?

Mr. FELDMAN. If I know the chairman of this committee—he will more than welcome the views of all of these bodies and this committee could be a real clearinghouse for ideas of that kind.

The CHAIRMAN. Don't you think that we ought to hear from them in the course of these hearings?

Mr. FELDMAN. I would think so.

The CHAIRMAN. I would, too; and I am very glad our distinguished witness agrees to that. I want to ask you, in my own right, a few questions in reference to the development of space law. It is your position that we have not yet arrived at the position where we could codify space law so as to make it anything of any permanence or of any real utility to civilization. Isn't that right?

Mr. FELDMAN. That's right.

The CHAIRMAN. That we have to wait upon further development of the art in order to obtain enough information to formulate rules or courses of conduct in the application of international law.

Mr. FELDMAN. That's right. We know—in fact, it is axiomatic—that the codification of law is the result of custom and usage.

The CHAIRMAN. Don't you feel this way now, that we do have enough information so that we can proceed in reference to the use of missiles at lower altitudes? For instance, every witness who has appeared before us has referred to the fact that missiles are space vehicles. If they are ballistic missiles, they are vehicles.

If they are not ballistic missiles, they are space implements or weapons.

We do have enough information, don't you think, so that we could proceed to set forth certain rules covering the operation of missiles generally? The time may not be far off when we could use a ballistic

missile—that is, a missile which is a vehicle—for transportation purposes.

Mr. FELDMAN. The greatest thing we could do right now, that could be done—it may be too idealistic, but if it could be done—would be to have all the nations agree to file prelaunching schedules and to permit inspection.

The CHAIRMAN. That could be done at once?

Mr. FELDMAN. If it could be done, it would be the greatest step forward from a legal point of view.

The CHAIRMAN. It shows that you are going in the right direction, because our own country, before we set up this missile course in the South Atlantic, took up the matter of an agreement with the several nations whose sovereignty might be violated—assuming you would call that a violation of sovereignty—for a missile to pass in the air above a nation or a country or a territory.

We took that up with those nations and worked out an agreement before we set up the downwind range in the South Atlantic. That is correct; isn't it?

Mr. FELDMAN. That is not only correct, but it furnishes the precedent for what we are seeking to do on a worldwide scale.

The CHAIRMAN. It really is formulating the very first principle of space law.

Mr. FELDMAN. That is right.

The CHAIRMAN. As you go higher with these space weapons or vehicles, of course you get into more difficulty. But as far as operating them, we would say under 100 miles, it would seem to me that we could formulate some very sound principles of the use of space at lower altitudes above the earth, and especially when it is a vehicle which will return to the earth.

There should be some principle set up covering the liability of the initiating party for damages done when that vehicle or that missile or that weapon returns to earth. Isn't that true?

Mr. FELDMAN. That's right. That is an area, too, that could be covered. But I don't think it should be a question of whether the vehicle goes 100 miles or 5,000 miles, personally. I think it is what is in back of the launching of that vehicle that counts.

The CHAIRMAN. The principle there is the same whether it be 500 or 5,000 miles.

Mr. FELDMAN. The question is: What is the motive?

The CHAIRMAN. The point I am getting at is, where you deal with areas immediately above the Earth, it is easier to adjust principles that will work and we can be assured will work between nations at this time. Isn't that correct?

Mr. FELDMAN. Yes.

The CHAIRMAN. When you get into outer space or deep space, that is where your problem goes off into infinity. For instance, just as you said this afternoon, just as another witness said this morning, when you attempt to use deep space, and you don't know what is out there, you are attempting to formulate rules of conduct covering something you don't know about.

Mr. FELDMAN. Correct.

The CHAIRMAN. For instance, when Senator Keating was here this morning, we referred often, in questions to him, about soft landing on

the moon. That is a possibility because the moon is only 200,000 miles away. But if you visualize that, or a landing of any sort on the moon, you certainly don't know what you would experience there.

Is that correct?

Mr. FELDMAN. You are bargaining without your host. You don't know what you are going to find.

The CHAIRMAN. Or who you are going to find there.

Mr. FELDMAN. Yes.

The CHAIRMAN. When you attempt to set up a code covering the use of space by the nations of this world, you then cover the rights of the parties—for instance on the moon—when you don't know what they are like or anything about their course of conduct.

Mr. FELDMAN. You don't know what anything is like. It is really trying to do something you don't know anything about when you set up rules of that kind.

The CHAIRMAN. When you have rules of that sort, you certainly have to have rules proceeding with the assumption that there was nothing in the way of human life on that particular planet.

Mr. FELDMAN. You know, it would be as if Congress passed an act repealing the laws of gravity. It would have about the same effect.

Mr. MCDONOUGH. It would have no effect, you mean?

Mr. FELDMAN. It would have the same effect.

The CHAIRMAN. Certainly because if there is something on the Moon, human civilization, we have no right to sit here in Washington, D.C., and legislate even if it is between nations, on the rights of parties who are remotely connected with any such arrangement.

Mr. MCDONOUGH. We are getting into local government here. We are legislating under the foreign policy of the United States on the conduct of people that are on the sphere.

The CHAIRMAN. That are without this particular Earth, though?

Mr. MCDONOUGH. Yes.

The CHAIRMAN. The point I am getting at is this—I want to get back to Earth now for a moment——

Mr. FULTON. Would you yield on your moon point a minute?

The CHAIRMAN. All right.

Mr. FULTON. Suppose a man from the Earth landed on the Moon and he said to this fellow in a plastic suit, "Take me to your leader," and that person replied, "I am a stranger here myself."

The CHAIRMAN. "I am a Russian."

Mr. FULTON. No, you don't know where he is from. He may not be from the moon.

The CHAIRMAN. Did you get your answer to that?

Mr. FULTON. I think I got the laugh.

The CHAIRMAN. The point I am getting at is this, if you attempt to do that, you are certainly going to have to have at least two codes of conduct. One on the assumption you will find nothing there; the other, the assumption you will find human beings there.

Mr. FELDMAN. We have to be realistic. We know there is a possibility of coming to an agreement on launching sites, on inspection, and on flight plans. The same holds true with respect to radio frequencies and so on. These are areas that we know about, and even in those areas you would have disagreement. It would take some time before you could set up a code of rules.

But I say, begin the study now and work in those fields and then grow from there.

The CHAIRMAN. I think that this country could perform a monumental service by beginning a study of that sort.

Mr. McDonough, do you have a question? Let me finish first, unless you just have a question.

Mr. MCDONOUGH. No, I am asking for time.

The CHAIRMAN. Let me finish. I will be through in just a moment. I want to ask you a question or two more. In reference to reconnaissance vehicles, for instance, you testified yesterday that within the next 2 years we may have communication satellites around the earth. In reference to communications, weather satellites, reconnaissance vehicles, we certainly could be studying the rules of conduct in reference to the use of those things at this time.

Mr. FELDMAN. We certainly could be. These are practical things that can be done now and should be done now.

The CHAIRMAN. Some of those satellites may be traveling around the earth as low as 100 miles from the earth's surface.

Mr. FELDMAN. Yes, sir.

The CHAIRMAN. So they do present a very practical proposition.

Mr. FELDMAN. They certainly do.

The CHAIRMAN. We know they will not disturb the housekeeper like these jets do when they go over the backyard, but they certainly would disturb nations and peoples generally if the thought was they were traveling above this country at 100 miles in regular cadence day after day and surveying all that they wished to.

Mr. FELDMAN. We could even look at it in another respect. Suppose you had a communications or a television satellite up and you had worldwide television. If we think the world has shrunk now, just think of what it will be with worldwide television.

The CHAIRMAN. You are going to have to have some control of the uses of television in space, international control.

Mr. FELDMAN. Precisely.

The CHAIRMAN. Likewise, if you don't have television, suppose you have this telegraph or this ticker-tape service there. That would have to be controlled by some international agreement, and certainly by basic principles of law.

Mr. FELDMAN. Yes. And I think the thing to do is to begin with the easiest one first and reach——

The CHAIRMAN. Which is the easiest one?

Mr. FELDMAN. I would think the one that should be done first would be the filing of international flight plans. One I think equally as important is the radio frequencies. If you started with those two, they would set a pattern.

The CHAIRMAN. What do you think of the proposal to set up a Department of Science?

Mr. FELDMAN. I think eventually we are coming to that. In fact, I thought at the time of the creation of this committee that this was the first step in that direction.

Mr. MILLER. That's right.

The CHAIRMAN. As a matter of fact, however, shouldn't the recommendation for such a department really come from the executive branch of Government first?

Mr. FELDMAN. I would think so, under our form of government, yes.

The CHAIRMAN. Under our form of government, they are the ones that should feel the need of such a department, rather than the legislative branch, and they should ask for it if they feel a need.

Mr. FELDMAN. The setting up of the latest Federal Science Council may be a step in that direction, too.

The CHAIRMAN. Mr. McDonough?

Mr. MCDONOUGH. I just want to welcome Mr. Feldman to this committee. I am sure we recognize him as a very capable administrator of this committee at its inception.

You have left a monument to yourself behind, Mr. Feldman, for us to follow. We respect your opinion on this very complicated subject.

The question of determining some basis on which we could set up law and the sovereignty of a nation in space has many ramifications. I am looking at some of the hearings, the questions we put to Mr. Cooper and Mr. Loftus Becker when we had the special committee operating.

It seems to me that since there has been no challenge by any nation—the only two that have used outer space are Russia and the United States—neither have challenged the other about the use of outer space—Britain, yes, but no nation that has used outer space has challenged the other for the use of it—there is a kind of common law that it is the open seas philosophy. If you conduct yourself properly, you have the use of it.

However, it appears to me that if Russia should release a warhead to the United States and it got beyond the present area that is looked upon as a legal area—that is, the operational section of the atmosphere that we know where airplanes can fly—that that could be considered abandoned and whatever occurred to it in that abandoned area where there is no law now, no nation could be responsible for having destroyed it.

Does that appear to you to be a logical reasoning?

Mr. FELDMAN. It seems to me if it had a warhead on it and was aimed at the United States it would be an act of war.

Mr. FULTON. But the right of peaceful passage is a different thing from an act of war.

Mr. FELDMAN. The right of peaceful passage. You talked before of the freedom of the seas. I believe for over 300 years they have been trying to codify maritime law without success. They have had repeated conventions—one last year—and got nowhere. One of the reasons why they haven't and why the rules change from time to time is because a nation can thumb its nose at another nation by saying, "This is what it is going to be." So long as it has the power to back up what it wants to enforce. That doesn't mean it is recognized.

Mr. MCDONOUGH. That is the theory of might makes right.

Mr. FELDMAN. Precisely. We are in that state right now.

Mr. MCDONOUGH. On the seas?

Mr. FELDMAN. No, not on the seas. Insofar as missiles are concerned. We can't do anything about it.

I don't think there is any implied consent from the fact that we continue to put up missiles or satellites. This does not give us a right to keep on ad infinitum. I think it is just because nobody can do anything about it at the moment.

Mr. McDonough. Do you believe that Russia recognizes that as well as the United States?

Mr. Feldman. She not only recognizes it, she initiated the situation. She literally can ignore us until we can do something about it. When we can do something about it, she may sit down and agree with us.

Mr. McDonough. Suppose the United States had the capability of intercepting the operation of one of the Russian satellites that is now going around the earth and went up there and intentionally did that. That satellite is now operating beyond the recognized legal air space that we consider an invasion of our sovereignty.

In other words, we couldn't fly a manned plane over Russia today without it being considered an overt act. But this satellite is out beyond the area that is now recognized for legal and defense purposes.

Is that satellite in the abandoned area where there is no law? And if it were destroyed, wouldn't the nation that destroyed it be responsible or would the nation that released it consider that they had abandoned their property by putting it into an area where there is no law at the present time?

Mr. Feldman. That is hard to answer because we are dealing with something you just can't put your finger on. But if that ever happened, then maybe you could sit down with that other nation and begin to enter into an agreement as to what you can and cannot do.

Incidents of that kind often bring people together across the table.

Mr. McDonough. Doesn't the sovereignty of a nation insofar as air space over it is concerned, extend to the height of that? I mean, there is no limitation on the height of the sovereignty of a nation over the geographical ground area of the nation.

Mr. Feldman. That is a theory that has been expressed. But don't forget, this earth is moving on its axis all the time.

Mr. McDonough. I understand. But let it move. Of course we can't stop it. But even if it is moving, the geographic area as defined in space would move with it, and that area would be the area that would be the sovereignty of the nation.

Mr. Feldman. Not that particular point in space.

Mr. McDonough. I made that point in the select committee when we were discussing it, that that would change from instant to instant. But doesn't the air space that we now consider our sovereign right also change?

Mr. Feldman. Yes, it does. But that was the result of international agreement. Of course I know Russia is no party to it, but at least they recognized the fact that they have to file flight plans and that they have to abide by these rules and so on. But that was the result of international agreement. This could be the basis for international agreement. If that is what you are trying to say, I agree with you.

Mr. McDonough. Do you know whether there is any charting of the known universe that we are in with the sun as the center and its planets around it? Is there any charting of that area like there is a charting of the ocean?

Mr. Feldman. Scientists are trying to do that, but the task is difficult because they are finding out new things all the time. We do not have the earth mapped correctly yet.

Mr. McDONOUGH. Of course I agree we haven't got it correctly mapped because we are finding it out. But at least we do have a basis to go on, longitude and latitude. We can come to a point. We don't have that in space, you mean?

Mr. FELDMAN. We have something in space that is more than a beginning point, I am sure, but it is far from accurate.

Mr. McDONOUGH. Do you think we need that before we can establish any basic laws?

Mr. FELDMAN. Not necessarily, no. These are basic things concerning the operation of space vehicles and satellites and missiles and so on.

Mr. McDONOUGH. Do you think that space law can be developed by treaty?

Mr. FELDMAN. Yes, and I think the United Nations is the proper medium through which it should be done.

Mr. McDONOUGH. That is all, Mr. Chairman.

The CHAIRMAN. Any further questions?

If not, Mr. Feldman, again I say on behalf of the committee, we are most appreciative of your coming here and giving your testimony this afternoon. We would like to know whether as a committee that we can call upon you at times in the future as a consultant for the committee?

Mr. FELDMAN. You certainly can, Mr. Chairman.

The CHAIRMAN. I think you have helped lay the foundations for a great new era and we appreciate what you have done.

Mr. FELDMAN. I would like to make this last comment. If I made a contribution, it was by virtue of the fact that we had an extraordinary committee and a superb staff. Working with them was an inspiration.

The CHAIRMAN. Thank you, sir. We are very happy to have you.

We have one more witness this afternoon, Mr. Frederick C. Durant III, executive assistant to the director of Avco Research Laboratory, Everett, Mass. He was formerly president of the American Rocket Society and the International Astronautical Federation. Do you have a prepared statement, Mr. Durant?

Mr. DURANT. No, sir. I have some notes that I will speak from.

The CHAIRMAN. If you will proceed, we will be glad to hear from you.

STATEMENT OF FREDERICK C. DURANT III, EXECUTIVE ASSISTANT TO THE DIRECTOR, AVCO RESEARCH LABORATORY, EVERETT, MASS., AND FORMER PRESIDENT, AMERICAN ROCKET SOCIETY AND INTERNATIONAL ASTRONAUTICAL FEDERATION

Mr. DURANT. By way of reference to my previous appearance before this committee last April 30, I am again very honored to have this opportunity to address some remarks to you gentlemen and to answer any questions you might have.

My background is as an engineer, not as a scientist, but with half of my professional life in the military and half in research and development activities in rockets and guided missiles. Over the past 9 years I have met and talked at some length with people of similar backgrounds representing the thinking on space flight in about 26 countries.

The CHAIRMAN. Are you with Avco now?

Mr. DURANT. I am with Avco, at Dr. Kantrowitz' Avco Research Laboratory in Everett, Mass. The laboratory is a division of Avco Manufacturing Corp. and is engaged in reentry physics and high temperature gas dynamics research.

When I appeared last April, gentlemen, I set forth four suggested programs of international cooperation in the realm of space flight. I was most pleased that the House Select Committee on Astronautics and Space Exploration saw fit to recommend these four points in its report (H. Rept. No. 1758, May 21, 1958; p. 19 et seq.). These programs, briefly, were: (1) the collection and dissemination, in several languages, of information on space programs, both of this country and others; (2) the establishment of graduate-level, science scholarships available on an exchange basis, or by international competition; (3) establishment of an international competition in designing research payloads to be installed in some U.S. satellites; and (4) a call for an international conference on the peaceful applications of rocket power.

All of these points which I still believe are sound were reviewed by the International Astronautical Federation, which represents the rocket societies of some 26 countries now, and unanimously endorsed at the Ninth IAF Congress held in Amsterdam last August.

The further study of these points and other ideas by the committee resulted in expansion of these concepts into a seven-point program. These were elucidated on page 14 of the House Select Committee publication (H. Rept. No. 2709) of January 3 entitled "International Cooperation in the Exploration of Space." None of these seven points to my knowledge have been implemented, nor initiated.

One reason for interest in action on these points is because, in my opinion, there continues to be a complete vacuum of leadership in the area of international cooperation in astronautics, other than some interchange of scientific data within the past International Geophysical Year. One reason given for lack of cooperation in space vehicle operations of the U.S. and U.S.S.R. to date is the quite valid interest in protection of the military security details of rocket launching vehicles. Neither the Russians nor this country are willing, I am certain, to discuss freely details of their launching vehicles because of the close relationship of this technology with ballistic missile technology.

On the other hand, the details of the scientific instruments carried as payloads in satellites and space probes have been quite openly released by this country and to a somewhat lesser extent by the U.S.S.R.

Again this country, to a large extent, and the U.S.S.R. to a much lesser extent, have released the data which was obtained.

But these two countries represent only 15 percent of the world's population. About 85 percent of the world is standing by as a passive observer in this exciting new development of space flight. And in all of these countries there are brilliant scientists and engineers. And also youngsters in high schools and universities anxious to move into advanced academic training and wanting to participate, quite naturally, in this science of astronautics.

In all of these countries, outside the United States and the U.S.S.R., there is little or no opportunity for participation. I believe this sets

the scene wherein the United States could make a valuable contribution in assisting qualified persons in these other countries to play some role, to make it possible for them to be other than simply passive observers in this exciting exploration of a whole new dimension.

In my opinion, by taking steps to assume leadership in this way, the United States will go down in history as having recognized a very normal need and expressed a willingness to share this heritage with other countries.

If the United States would recognize the normal desires of competent individuals all over the world (whose nations do not have space exploration capabilities because they do not have large rockets) to study and participate in astronautics, not only would these frustrations be alleviated, but a sympathetic attitude toward U.S. space exploration would be created. If the United States made it possible, at first only on a token basis, for interested foreign scientists and engineers to work on or contribute their ideas to unclassified research programs, initiative in world leadership in international cooperation would be established. The U.S.S.R. would be forced by world opinion to follow this lead. Similarly, if the U.S.S.R. should initiate a bold program of international cooperation, this country would certainly have to trail along. The opportunity to lead still exists but, unfortunately, will not always be present.

There are many small, but valuable, programs which might be initiated, preferably coordinated by one organization. For instance, the Space Handbook: Astronautics and Its Implications published on January 3, 1959, by the House Select Committee on Astronautics and Space Exploration, might be given wide international distribution. This excellent staff report is most informative and fascinating. It is suggested that single copies might be sent to the libraries of every high school in the world to inform and to answer questions of students. An accompanying letter might state that the copy is being sent "in the interest of informing youth of basic physical principles of space flight and rocket technology." The U.S. Information Agency and the International Astronautical Federation might serve as distribution agents for these reports, which, incidentally, might have certain deletions.

In any event, a program sending perhaps 100,000 copies of this report would cost, I would judge, $50,000. I believe that such a program would result in widespread stimulation of interest in and greater appreciation of U.S. space research activities.

The U.S.S.R. is well aware of these various proposals for international cooperation. In fact, they participated at the IAF Congress in Amsterdam in reviewing these suggestions and they endorsed them. I would invite the attention of the committee to the possibility that should the U.S.S.R. assume a position of leadership in this area by acting on the proposals that have been endorsed and developed by this committee, this country cannot help but follow their lead.

We are in the position of not knowing whether this might happen and we run the risk of finding this country following once more behind the U.S.S.R.

The U.S. ability to initiate action on matters of international cooperation, incidentally, is not related to the current superiority of the U.S.S.R. in rocket propulsion capability. In fact, action on the

part of the United States would deflect world attention from our current secondary position in this regard.

Much can be done with paper and with relatively few thousands of dollars. The main thing is to start modest programs, establish communications channels and identify key foreign individuals.

I was most interested in the testimony of Senator Keating and Mr. Feldman today. I certainly concur with the interest of both gentlemen in taking some concrete steps in the areas of international agreements resulting eventually in international law.

The first steps with regard to international agreements are long overdue. I suggest that simple affirmations of acceptance of liability and responsibility for damage, as caused by launching vehicles falling on property or the very, very, small risk of damage to property by falling satellites, would be appropriate. To date, I do not believe that either the United States or the U.S.S.R. has publicly expressed their recognition of such liabilities.

The days of recoverable satellites are almost here. We will have recoverable sattelites this year, and so will Russia—if they have not recovered them already. Soon numerous satellites will be coming down to earth, probably not always under complete control.

It seems to me that the least that could be done would be that this country affirms its responsibility in any liability resulting from space-launched vehicles.

In summary, I believe that we should be taking positive steps through the ad hoc Committee on Peaceful Uses of Outer Space of the United Nations. I am rather disappointed that nothing has come out of the establishment of the U.N. study committee which was set up nearly 3 months ago.

I may be presumptous, but I think it is up to you gentlemen to make recommendations for action to the U.S. membership of the U.N. committee, as well as to the President's Space Council. Many of you gentlemen have been exposed to the thinking of some of the most competent people in this country—scientists, engineers, and legal minds who are working on space programs. It seems to me that this committee could make recommendations and suggest policies that the Space Council might implement. As you may infer, I am in favor of action.

Thank You, sir.

The CHAIRMAN. Thank you very much, Mr. Durant. We appreciate very much your statement. Any questions?

Mr. FULTON. I want to compliment you on an excellent statement, and also to thank you for appearing again before the committee. You were a stimulation to many of us last year when you appeared before our select committee of the House.

You have spoken of international cooperation in the field of space. Actually, Communist China was one of the original adherents of the International Geophysical Year. Then when free China, or Formosa, joined, that is when Red China withdrew for political reasons.

Is that not right?

Mr. DURANT. That is my understanding, sir.

Mr. FULTON. So that at one point, when the IGY started out, it looked as if every country of the world would be cooperating with their scientists on matters that were not of strategic military impor-

tance. There would be a free exchange of information. Is that not correct?

So that even with international cooperation we do have already a precedent for international agreement in the space field, even including Communist China. Is that not right?

Mr. DURANT. I do not believe there would be any problem in the cooperation, as you know, within the scientific fraternity. This has been established and exists particularly well in the realm of astronomy and meteorology.

Mr. FULTON. And Red China is the only nation, then, that has actually withdrawn because of a political basis rather than a scientific basis. Is that not right?

Mr. DURANT. To my knowledge; yes, sir.

Mr. FULTON. Then would you recommend that if we do try to get international agreements, even when it does not mean the recognition of Communist China—I wouldn't want to inject that into this discussion—that we should proceed to try to get a worldwide methodology of handling space projects?

Mr. DURANT. It is a very sticky question—the aspect of recognition of Communist China—because there are within China competent rocket scientists and physicists. In some way a means should be sought to permit the opportunity of their participation.

Mr. FULTON. If there were a treaty with the United States, or an executive agreement with the Government of Red China, that would involve the recognition, either de facto or de jure, of Communist China. Therefore that method is probably out. Why could we not use the same system that we used on the International Geophysical Year, where an agency that our Government has confidence in, such as the National Science Foundation or such, could make the agreement which would be effective in making a cooperative approach to the problem of space, rather than get all tangled up in this recognition of China and the political aspects of it?

Would you favor such a thing as that?

Mr. DURANT. That might be a way of doing it.

Mr. FULTON. I believe last time you spoke of the fact that there should be courage and adventurousness in space. Do you still believe we should be looking forward to simply sending a new Columbus out and having him look to see what is out there?

Mr. DURANT. No. When I referred previously to adventurousness, I was speaking of an adventurous spirit in research.

I might comment with regard to cooperation as evidenced at the IAF Congress meeting in Amsterdam. While there I had the chance to talk privately with the head of the Russian delegation for some period of time with regard to international cooperation. We considered in which areas cooperation might be possible. The aspect of an international launching site was discussed. He pointed out the problems of protecting the security of launching vehicles for the immediate future. But with regard to tracking stations—that is, optical tracking stations or radio or radar tracking stations for satellites—he saw no reason why this could not be an area in which agreement could be reached.

So I do not believe it will be difficult if an attempt of this sort is actually made.

Mr. FULTON. Russia, according to the information you gave us last time, in 1955, through their Academy of Sciences had talked of a program of three stationary satellites over the equatorial belt, which has the same relationship we are now speaking of in our program in the United States and also in the same number—three. Do you know anything further about the progress they might have made on their project?

Mr. DURANT. This would be the stationary communications satellite program?

Mr. FULTON. Yes.

Mr. DURANT. I believe the original suggestion for that was by Mr. Arthur C. Clarke in 1945. He published a paper pointing out the global coverage of three satellites in this "stationary" 24-hour orbit.

As to where the Russians are, I simply don't know. I would be very surprised if they were behind us in their concepts or their plans to establish communications satellites.

Mr. Clarke wrote in his contribution to the select committee's "Next Ten Years in Space" of the power of the global television satellite with regard to impact on the minds of people. I believe that the Russians would be the last ones in the world not to recognize that power.

Mr. FULTON. I believe in this 1955 proposal the Russians had said they would have these stationary satellites as changing posts so that they would remain constant in respect to any airfield we might have on earth, and simply go up and possibly change them.

Is that within the realm of scientific possibility? They are always above you.

Mr. DURANT. It is certainly possible.

Mr. FULTON. So that actually, although they are going that fast, 22,000 miles an hour out there——

Mr. DURANT. Somewhat slower orbital speed. At 22,300 miles distance from the earth the velocity would be considerable less than the 18,000-miles-per-hour orbital velocity near the earth. It would be nearer 7,000 miles-per-hour velocity in "stationary" orbit, I believe.

If you are traveling out to those satellites you would match the speed, and the relative speed would be zero. So you would have no indication that you were traveling with any speed at all.

Mr. FULTON. Because it is always just above you, you would have to then accelerate to stay in the same place. It would be like the Red Queen in Alice in Wonderland. You have to run as hard as you can to stay right where you are.

Would that be about what it is?

Mr. DURANT. You would not take off from a point directly beneath but rather from some other launching site on the earth.

Mr. FULTON. You wouldn't go right up to it, even though it was right above you?

Mr. DURANT. No; you would probably spiral out. This is a matter of orbital mechanics. There are quite a number of trajectories that could be planned. The minimum energy one would be the one that you would probably follow.

Mr. FULTON. We have had a question earlier that the committee had disagreed on quite a bit. That was, when there is ownership of land or sovereignty over land on the earth, when it is projected out in a cone into outer space, the question is, if the property owner or the

nation owns the center of the earth and you then take the radius out from the center of the earth on either side of the piece of land or the nation and project those on out into space, there is no area, is there, or no point where they overlap?

I said there wasn't. I would like to have your view on it.

Mr. DURANT. If the boundary lines extended, do in fact run through the center of the earth, there is no overlap. By the same token, if you projected an area, the same area as the country involved, straight out with parallel lines which would not be perpendicular to the earth's surface, then you would also have cones of unowned land in between.

Mr. FULTON. That would develop between them.

Mr. DURANT. Exactly. But this is academic because there is all the area over the seas which no one owns. But I don't believe any nation has sovereignty above 100 miles.

Incidentally, all the legal references refer to airspace, as you know; but airspace has not yet been defined. Presumably it would be something less than 100 miles altitude.

But we can only control airspace, from a military standpoint, to perhaps 20 miles now.

Mr. FULTON. There is no overlapping, though, of sovereignty of nations on either the theory of the perpendicular lines erected from the edges of a country or property, perpendicular to the crust of the earth, because there it makes a cone between them as they arise, where there is no ownership.

Nor is it where you have ownership to the center of the earth and come out on a radii from the earth's center, and intersect the outer boundaries of the piece of land or the sovereignty of the country.

There is no overlapping?

Mr. DURANT. No, sir.

Mr. FULTON. Thank you very much.

The CHAIRMAN. Any further questions? If not, Mr. Durant, we do appreciate very much your coming here today.

Mr. DURANT. Thank you very much, Mr. Chairman.

The CHAIRMAN. We are going to consider, reread, and study the testimony you have given us. Thank you very much.

The committee is now adjourned until tomorrow morning at 10 o'cock.

(Thereupon, at 4:10 p.m., the committee recessed, to reconvene Friday morning, 10 a.m., March 6, 1959.)

FRIDAY, MARCH 6, 1959

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C.

The committee met at 10:05 a.m., in room 356, Old House Office Building, the Honorable Overton Brooks, chairman, presiding.

Present: Representatives Brooks, Fulton, Miller, Teague, Anfuso, Osmers, Sisk, Quigley, Bass, Riehlman, Wolf, Karth, Daddario, King, and Roush.

The CHAIRMAN. Members of the committee, Friday, at this time of the year, is not the best day for a committee meeting, but we are anxious to get ahead with our program. So we have this hearing set this morning.

We have two witnesses this morning. We have Dr. Francis O. Wilcox, Assistant Secretary of State for International Organization Affairs. We have Mr. Loftus Becker, Legal Adviser for the Department of State. The other day we reported a bill out, H.R. 4913. This morning we found out that the Departments wish to make a few changes, largely technical changes. Do we have a witness from General Services?

Mr. DUCANDER. We do, Mr. Chairman. I might explain that the members have a typewritten sheet before them underneath the bill. The words that are in parentheses are the words that NASA wishes to strike.

The easiest way, I would presume, to amend it—if the committee agrees to these deletions—is to again strike all after the enacting clause and insert language with the words within the parentheses deleted.

The CHAIRMAN. I will explain to the members that this is a proposition where the General Services wants to be assured by the language of the bill that it is contemplated that General Services be used in the leasing of the new space. That is the only change at all.

The original bill permitted General Services or other authorities to do the leasing, but this would make it mandatory for General Services to do it. NASA wishes that change, and General Services wants it, too.

Mr. DUCANDER. Yes, sir.

The CHAIRMAN. That is the only difference. I see no need really to have witnesses or anything on it.

Dr. Wilcox, would you mind coming forward, sir. This is the first time we have had the pleasure of having you down here, Doctor. I hope you will come back and see us often.

We will have, I believe, in this committee a good many things dealing with international affairs. Some of our members are especially interested in international affairs. They come from States that are close to Europe in tieup, financial, and also geography, and they are interested a great deal in international affairs.

Dr. Wilcox, do you have a prepared statement? If you would present it then, Doctor, we would appreciate it.

STATEMENT OF HON. FRANCIS WILCOX, ASSISTANT SECRETARY OF STATE FOR INTERNATIONAL ORGANIZATION AFFAIRS

Dr. WILCOX. Thank you very much, Mr. Chairman. I am very pleased to be here with the committee this morning to discuss this important problem.

In view of the nature of the subject matter, I believe it would be better if I would read the statement rather than attempt to highlight the main portions of it in an extemporaneous way.

The CHAIRMAN. Why not read the statement as you have it? I have seen a part of it, and it seems to be an excellent statement.

Dr. WILCOX. I welcome very much, Mr. Chairman, this opportunity to discuss with you and the other members of the committee the question of international cooperation in the peaceful uses of outer space and the steps which our Government has been taking in the effort to insure that this new frontier will be utilized for the good of all mankind.

THE ISSUE

The issue, it seems to me, is clear: Will man cooperate to insure the peaceful exploration and use of outer space? Or will present-day international rivalries hobble and cripple man's efforts to explore and utilize the resources of the universe around us?

Man's venture into outer space, which is both exciting and stimulating, is also a very natural development. Man's curiosity about his environment led first to his exploration of all of the areas of the planet on which we live.

Now science and technology have combined to make it possible to project his intellect and his curiosity outside this earth's atmosphere. I am sure that I voice the views of all of you when I express the hope that in this projecting himself beyond the confines of our planet, man will not also project those international rivalries and disagreements which have all too often hindered his progress toward a better way of life on this earth.

UNITY OF PURPOSE—CONGRESSIONAL ACTION

All of us here, Mr. Chairman, will recall the initiative taken by the House of Representatives last June when it passed a concurrent resolution introduced by the distinguished leader of the House, Mr. McCormack. This resolution expressed "the devout wish of all peoples everywhere, in every nation, in every environment, that the exploration of outer space shall be by peaceful means and shall be dedicated to peaceful purposes."

The resolution went on to express the view of the Congress that the nations of the world should join in the establishment of plans for the peaceful exploration of outer space and that they should endeavor to broaden man's knowledge of space in order to advance the good of all mankind.

THE U.N. GENERAL ASSEMBLY ACTION

In an effort to implement this resolution and other initiatives by the United States to foster the peaceful uses of outer space, our Government proposed last fall at the United Nations General Assembly that a representative committee be established to make the necessary preparatory studies and recommendations as to the most fruitful actions which might be taken by the United Nations to facilitate the peaceful exploration of outer space.

Our thought here was a very simple one. Outer space is an area in which science and technology are each day making great and meaningful strides. But it is also an area in which we have as yet only a minimum of knowledge, information and technical know-how. Therefore, before seeking any final decisions as to what the United Nations might usefuly do in this area, we felt it important to provide first of all for a broad survey of the kinds of action which the United Nations might take to facilitate man's peaceful exploration of outer-space.

This view was endorsed by the General Assembly. As a result of our initiative, the Assembly adopted a resolution establishing an 18-

member committee to survey the outer space field as it may concern the United Nations and to report to the next General Assembly.

The resolution specifically requires the committee to study four things: First, the activities and resources of the United Nations, the specialized agencies of the United Nations, and other international bodies in this field.

Second, the scope of international cooperative programs in the peaceful uses of outer space which would appropriately be undertaken under United Nations auspices for the benefit of all.

Third, future United Nations organizational arrangements to facilitate international cooperation in this field.

Finally, the nature of the legal problems which may arise in carrying out programs to explore outer space.

I shall discuss each of these aspects of the resolution in detail later on, and also indicate to you what the United States is planning to do to assist in the implementation of this resolution.

However, I think it may be useful first to recall certain aspects of the debate which preceded adoption of the resolution. This may be useful because, as I indicated earlier, we feel very strongly that here is an area where international rivalries should not obtain. Here is an area where we can, if we and others are wise enough, use man's ingenuity and his abilities to contribute to the well-being of all mankind.

Indeed, it would be tragic if we were to repeat in outer space our unfortunate experiences in the field of atomic energy. Our failure to achieve agreement on nuclear disarmament delayed for a considerable period, as you know, the development of an international program for the peaceful uses of atomic energy, which is now being carried forward through the International Atomic Energy Agency. We maintained in the United Nations that progress in the peaceful uses of outer space could proceed independently of our continued efforts to move forward on the highly contentious and complex issue of disarmament. We therefore urged the Soviets to work with the United Nations in developing a useful program of international cooperation in outer space.

THE SOVIET ATTITUDE

Unfortunately, our efforts to persuade the Soviets to bring to bear on this problem their considerable know-how and experience have thus far been unsuccessful.

General Assembly consideration of this subject began with a Soviet attempt to inject extraneous political issues into the serious effort of the United Nations. They talked about so-called foreign bases, nuclear testing, armaments races, and other largely irrelevant issues. Their aim, apparently, was to divert the United Nations from its clear purpose.

In this connection our representatives at the United Nations were greatly assisted in our efforts to keep the record straight, by Senator Lyndon Johnson's excellent speech before the United Nations. He pointed out that the issue before the General Assembly "was to erase the accumulated differences of our earth's long and troubled history and to write across the vastness of space a proud new chapter of unity and peace." Senator Johnson then called upon the Assembly to take the necessary steps to keep outer space" unscarred by conflict * * *

to keep space as man has found it, and to harvest the yield of peace which it promises." This, he said, could be accomplished through a "course of full and complete and immediate cooperation to make the exploration of outer space a joint adventure."

I believe that this speech by Senator Johnson and the favorable response which it received in New York was instrumental in causing the Soviets to revise their original resolution. They stripped their proposal of many of the extraneous matters which it contained and presented in its place a resolution which was more germane to the issue under study. The revised Soviet resolution, as a matter of fact, was incorporated almost in toto, insofar as the substance was concerned, in the resolution which was originally introduced by the United States and 19 other countries.

THE SOVIET DEMAND FOR PARITY

We were hopeful that what appeared to us initially to be a minor question—namely, the composition of the committee which would study the problem of outer space—could be resolved. However, we discovered very quickly that the Soviet Union was not prepared to handle this problem in the normal way and establish a committee which would be representative of the United Nations as a whole. They insisted, on the contrary, on so-called "parity" in the committee.

They overlooked completely the important role which many nations large and small are in fact playing in this important field.

They overlooked the cooperative endeavor established under the International Geophysical Year.

They overlooked international arrangements for tracking and monitoring satellites and space programs.

They overlooked the large areas of medical research on which many nations have made and are continuing to make helpful contributions.

They overlooked the many eminent legal minds throughout the world who are now working on the legal aspects of outer space.

The Soviets not only wished to limit committee composition essentially to a balancing of United States and Soviet interests, but in addition they also insisted that they be given the right to determine whether specific nations should or should not be named as members of the committee. Obviously the United States could not agree with this Soviet position which would drastically alter the very concept of the United Nations itself.

We attempted to work out with the Soviets—and in this connection Ambassador Lodge had several conversations with the Soviet representative—a compromise on committee composition which recognized their prominent position in this field, but which also recognized the legitimate interests of other members of the United Nations. However, our efforts to obtain agreement proved fruitless. After the Assembly, by a vote of 53 to 9, endorsed our resolution, the Soviet Union, Czechoslovakia, and Poland, all of whom were named in the resolution to be members of the United Nations Committee on the Peaceful Uses of Outer Space, announced that they would boycott the committee.

There is no doubt that the Soviet Union could make a valuable contribution to the work of the United Nations committee. There is also no doubt that the committee will be able to do effective work, even if

the Soviets follow through on their announced intention to boycott it. In any event, I sincerely hope that the success of this committee will eventually lead to a real desire on their part to cooperate.

I would like now to discuss how the United States envisages the work of the committee and our participation in it. It is unfortunate that the Soviets injected political issues into this operation. We consider the work of the committee to be essentially nonpolitical.

That we are deeply interested in the scientific and technological aspects of the committee's work is obvious, I think, from the representation which we have named to the committee. Our chief representative is to be our Ambassador to the United Nations, Henry Cabot Lodge. I think that a number of other countries which are members of the committee will also name their permanent representative to the U.N. as their chief delegate.

One of our alternate representatives is Dr. Hugh L. Dryden, Deputy Administrator of NASA, who is recognized as one of the leading scientists in this new field of space exploration. We look to Dr. Dryden and to his scientific colleagues, both in and out of Government, to carry a major load for the U.S. delegation. With their scientific and technological know-how, they will certainly be of material assistance in the work of the committee.

In the legal field, which is also to be studied by the committee, we will be represented by the legal adviser of the State Department, Mr. Loftus Becker, who is with you this morning, Mr. Chairman, and who has a deep interest in this particular area of international law.

WHAT THE U.N. COMMITTEE CAN DO

Now let me turn to the specific details of the committee's work. The resolution passed by the Assembly first of all calls for a census of the activities and resources of the U.N., its specialized agencies, and other organizations in this field. This will include the facilities and work being done by the International Telecommunications Union, the World Meteorological Organziation, the United Nations Educational, Scientific, and Cultural Organization, and other governmental groups, as well as the activities and resources of the Committee on Space Research (COSPAR) of the International Council of Scientific Unions, and similar nongovernmental organizations. We are already undertaking a survey of these facilities and activities. Obviously the committee can carry out this portion of the resolution whether or not the Soviet Union participates, and I find it very difficult to see how anyone can ascribe political connotations to this kind of endeavor.

The next aspect of the committee's work is an examination of the kinds of activities the U.N. might undertake to further the peaceful uses of outer space. We are at the present time developing documentation utilizing governmental and nongovernmental resources which we hope will be useful to the committee in this respect.

The areas of cooperation which might be undertaken by the U.N. are exceedingly broad. We believe, moreover, that the U.N. will encourage rather than discourage nongovernmental international cooperative programs which are presently underway, particularly those under the aegis of the Committee on Space Research of the International Council of Scientific Unions.

I am aware, Mr. Chairman, that some have suggested that governments and governmental organizations should stay out of this field, and that international cooperation should be left strictly to private organizations. I am also aware that highly significant work has been accomplished by nongovernmental groups under the International Geophysical Year program and that promise for continuing cooperation exists in the programs now being developed by the Committee on Space Research of the International Council of Scientific Unions. Clearly the scientists of the world working together have a great deal to contribute to the peaceful exploration of outer space.

But I also believe that if outer space is to bring to mankind the great benefits which it promises, it will also be necessary to seek international cooperation on the governmental level in a number of areas. There is a great deal of significant work which can be undertaken with the assistance of the U.N. or through cooperation between the U.N. and nongovernmental international scientific groups, and many of these programs should be undertaken very shortly, lest we take action now which will make more difficult in the future man's use of this vast area.

For example, we have all heard about the use of outer space and space vehicles, either manned or unmanned, for such things as meteorological studies, mapping, communications, and navigation.

The chairman of this committee recently pointed out that at least $2 billion a year could be saved in the United States alone by the use of weather satellites capable of making reliable, long-range weather forecasts. Estimates of the gains that might result from the use of communications satellites are equally impressive. Yet it is possible that by failing to take certain vital steps at the present time we may make more difficult the accomplishment of these important gains.

Thus, up to the present time little has been done to provide a permanent and continuing record of the orbits of objects which are sent into outer space. Possibly a United Nations central depository for such data would be useful in preventing collisions in outer space.

Another area of cooperation might be a U.N. resolution urging that nations agree on the regulation of radio transmissions from space satellites. As we all know, most vehicles sent into outer space at the present time are sent there for a particular experimental purpose. This purpose frequently has a limited duration, and the information which is returned to the earth from the satellite becomes useless after a scientifically determined period of time has elapsed.

At the present time we and the Soviets are sending into space some satellites equipped with solar batteries which have an indefinite transmitting life. Unless agreement is shortly reached on arrangements for terminating such radio transmissions after the experimental data have been collected, we may soon find radio frequencies cluttered with transmissions which are useless to mankind. Agreements between governments are needed, and the United Nations might well serve as a catalyst in this connection.

While we talk about the vastness of outer space, we must not forget that even in this vast area we must anticipate that there will be traffic problems if we continue to allow dead satellites to orbit above the surface of the earth. Through international agreement, possibly stimulated by United Nations action, it might be possible to work out

arrangements for eliminating satellites once they have served their purpose.

Most of us probably agree that in the very near future manned vehicles will be traveling through outer space. The reentry and recovery of such vehicle may well provide another area of fruitful international cooperation. Here again I believe the United Nations could play a useful role.

Now, Mr. Chairman, the foregoing examples are illustrative. They do, however, indicate a few of the areas in which the United Nations may be able to assist man to insure the peaceful uses of outer space. I cite them as indicative of the kind of thinking that is now going on within our Government in preparation for assisting the United Nations outer space committee to make purposeful recommendations concerning the possible activities which the United Nations might undertake in this field.

A third area which the United Nations committee will study is the future U.N. organizational arrangements for facilitating international cooperation in the peaceful uses of outer space. We have not as yet developed definite views within the Government as to the nature of the organization which the U.N. may wish to establish in the future.

But I do wish to emphasize again, Mr. Chairman, that the United States does not propose to support any action which would result in the exclusion of nongovernmental international organizations in this field. Nor is it our intention to support the setting up of a U.N. organization which would make the functioning of nongovernmental organizations more difficult.

I might add that I am personally convinced that this view is shared by most of the other members of the United Nations. I believe, however, that there is an important area of international cooperation in the peaceful uses of outer space which can best be accomplished through the cooperative efforts of governments, and that suitable U.N. arrangements will facilitate the development and implementation of such useful activities.

The resolution also requires the committee to study the nature of legal problems which may arise as a consequence of the opening of outer space to man's use.

Mr. Becker will discuss this matter at greater length. Let me only say here that legal minds throughout the world have been concentrating on this problem, and I am sure that the U.N. committee can make a useful contribution in this area.

THE UNIVERSAL INTEREST IN OUTER SPACE

Some people have questioned the desirability of the United Nations undertaking a program in the field of outer space. If there ever was an area in which the United Nations had a legitimate interest, the peaceful development of outer space would certainly seem to me to be such an area.

After all, technological developments and scientific breakthroughs are not the exclusive monopoly of any nation or of any people. We all know, and the history of mankind amply demonstrates, that ingenuity has never been restricted by national boundaries. Great discoveries have often been made in small laboratories in isolated areas of the world.

In the field of outer space, many nations, large and small, are already playing significant roles. Peru, Chile, Ecuador, Iran, India, Australia, and many other countries, are part of a worldwide network of tracking and monitoring stations. In these stations hard-working scientists are daily collecting data which is of the greatest scientific and technological value. Many countries also can render very valuable assistance in the analysis and study of this data. Moreover, it is reasonable to expect that as time goes by, many nations will be launching space vehicles of various types.

As we gather new knowledge from our efforts to penetrate the universe; as man attempts to adapt to this area and explore it, we can certainly expect revolutionary changes in medicine, nutrition, agriculture, and numerous other fields associated with man's welfare. These developments will affect the daily lives of men and women in every part of the world.

Accordingly, we encourage joint action and are prepared to cooperate with all nations in this endeavor.

We do not consider that this is a simple, "big-power" monopoly.

We believe that only by many nations joining in this endeavor can we hope to provide the fastest, cheapest, and most efficient progress in this important field.

We realize that no matter what happens, the study and exploration of outer space will go on and will take us where no human being has ever been before.

It is our hope that this exploration, which I repeat will affect every single person in the world, can be used to benefit all of the peoples of the world.

It is clear to me, therefore, that the United Nations does have an important role in this area, and it is my hope that the United Nations, by fostering cooperative efforts in the peaceful uses of outer space, will avoid the projection into man's newest frontier of those harmful, international rivalries which exist on this earth.

Thank you, Mr. Chairman. That concludes my prepared statement.

The CHAIRMAN. Doctor, we certainly thank you for a very fine statement. It is a thought-provoking one. It is the type of statement that we have not had in the past because it does bring into focus the international situation. You would, I judge, keep outer space in another world in truth and in fact. You would keep out the rivalries and the sinister influences of the present earth and keep the great reaches of outer space in a pure, pristine condition.

Isn't that correct?

Dr. WILCOX. Mr. Chairman, that would be an ideal goal toward which we should strive. I don't know that it is going to be possible to do that. But it is clear to me that if we move ahead now into outer space and don't take steps to discourage those harmful rivalries which so often exist here on earth in connection with some of these matters, we will be missing a great opportunity.

The CHAIRMAN. To do that, of course, you would have to have agreements among the peoples of the earth. From what you have indicated in your statement, there is some difficulty in getting any enforcible agreement with Russia.

What are we going to do if you don't get Russia lined up with the type of an agreement which we can use to enforce against Russia?

Mr. WILCOX. Well, sir, that is a central problem which we certainly have to face up to in connection with this particular United Nations venture. There is no assurance at all that we will be able to secure Soviet support. Indeed you gather from my statement that up to this point the Soviet Union has been rather adamant in its refusal to cooperate.

Thus far, however, the committee has not met. It will probably meet sometime in April or May, and we shall then have an opportunity to see whether in fact the Soviet Union will carry through on its threat to boycott the committee.

The CHAIRMAN. Assuming the Soviet Union will boycott the meeting, what then would be your course of program?

Dr. WILCOX. I think there are many things that the committee can do with or without Soviet cooperation. It is true that the Soviet Union could make a very valuable contribution to the committee because it would have data that other countries would not have.

But the committee's main function, after all, is to prepare an inventory of things that can be done, of things that are being done, and of possible cooperative ventures in the field of outer space. I think this kind of inventory can be compiled even if the Soviet Union does not participate.

The CHAIRMAN. So you say initially anyway, the main function of the committee would be inventory, compiling data that had already developed, but has not been compiled in an audit form.

Dr. WILCOX. That is correct, sir, and when the assembly convenes next September this committee will have a report to make. At that time we would then determine, in the light of the committee's report, what the next step might be.

The CHAIRMAN. Do you think we will get cooperation from the Soviets in obtaining data from the Soviets, because they have been sending up satellites and missiles?

Dr. WILCOX. That remains to be seen.

The CHAIRMAN. What if we don't get the cooperation? The effect would be that the committee would be set up to compile data on the part of the United States.

Dr. WILCOX. And other countries who have such information, yes, sir. For instance, in many countries there are legal experts who are studying the legal aspects of outer space. There are other countries whose scientists have been analyzing the data that has become available. There are many contributions that can be made towards carrying out the objectives of the committee, even if the Russians don't participate. I think the committee's report could be more useful if they did participate. But I don't think we should merely mark time in order to humor the Soviet Union in this respect.

The CHAIRMAN. You would go ahead and codify the information available, even though it all does come from our people, the United States and its friends and allies.

Dr. WILCOX. Yes, sir, that is our intention at the moment, sir.

The CHAIRMAN. Would the committee then set up certain tentative ground rules, rules that would form the basis of an offer to the

Soviet as being a fair way in which to order the areas in space surrounding the earth.

Dr. WILCOX. What the committee would do in this respect and what the Assembly might do next fall, I don't know, Mr. Chairman. It would depend upon the preliminary studies that the committee makes and the inventories compiled in the four categories that I spoke of.

The CHAIRMAN. For the time being, you wouldn't let the commmitee go further than simply making an inventory.

Dr. WILCOX. No, sir, that is the assignment which the General Assembly gave it last fall.

The CHAIRMAN. Would the committee have within its jurisdiction the proposition of space law.

Dr. WILCOX. This is one of the categories which the committee is expected to study. Again this is to be an inventory of the legal problems that may arise in connection with the peaceful exploration of outer space.

The CHAIRMAN. That is not exactly an inventory, is it?

Dr. WILCOX. It is not anticipated that at this time the committee would attempt to codify or lay down rules of law with respect to outer space at all—merely to identify the problem areas.

The CHAIRMAN. You would suggest the possibility of problems arising in the future.

Dr. WILCOX. Yes, sir.

The CHAIRMAN. For instance the collision of satellites.

The WITNESS. Yes.

The CHAIRMAN. The filling of space and air areas with a lot of gibberish from irresponsible broadcasting satellites. Is that correct?

Dr. WILCOX. That is correct. These are the kinds of problems presumably that the committee might identify. These, of course, would be subject to further study and analysis and action by the United Nations or by other appropriate international bodies or organs.

The CHAIRMAN. In that event, suppose we had a green light system for satellites up there. How would you enforce it if one of the major parties would not participate.

Dr. WILCOX. Of course that would present us with a very serious problem. I don't think you could have an enforcible system of inspection and control unless all of those governments participating in the exploration of outer space would agree.

The CHAIRMAN. That is the reason I suggested that your committee perhaps would want to go into the discussion of probable problems arising in the future, with the idea of their forming a basis of a plan or an offer which might later be acceptable to the Soviets.

Dr. WILCOX. I think, Mr. Chairman, as the work of the committee proceeds, there will be countries who will do what they can perhaps to persuade the Soviet Union that it is in their interest to cooperate with this very worthwhile venture.

The CHAIRMAN. Is any money available from the United Nations for such a program?

Dr. WILCOX. No, sir.

The CHAIRMAN. Where would the money come from.

Dr. WILCOX. The only thing that is contemplated at the moment is this very modest study by the committee. If any action program is to come out of the recommendations of the committee, that will be determined by the assembly next fall.

The CHAIRMAN. How much money would it take for the contemplated program?

Dr. WILCOX. The work of the committee, the preliminary studies of the committee, would cost very little. The expenses and the per diem of a few experts——

The CHAIRMAN. You mean $2 million or $3 million?

Dr. WILCOX. I should think much less than that, Mr. Chairman.

The CHAIRMAN. $1 million?

Dr. WILCOX. I am frank to say I don't have a financial estimate of what it would cost, but it would be taken care of by the regular budget of the United Nations. I don't think the expenses involved would be significant enough to make any special arrangement in the budget. Each government on the committee would send its own representatives. We would see that our representatives were in New York, ready to——

The CHAIRMAN. It would involve contributions by the different governments who are forming part of the United Nations.

Dr. WILCOX. That is correct, sir.

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. I yield to Mr. Riehlman at this time, yes.

Mr. RIEHLMAN. Mr. Chairman, I certainly do not feel, as I have said before, that I have any special privileges, being the man way down on the line here on the committee. But this is a most intriguing and interesting subject that we are considering this morning, and one that I think certainly will need tremendous study on the part of the committee that is being set up within the United Nations.

In listening not only to your statement this morning but other statements before this committee, one of the great things that I have been pondering is how we are going to control this outer space program. We are sending satellites up. Other nations are going to send them besides Russia. We get into a situation where we have to start at the core of this thing. This is a nucleus as I understand it, that is now starting in the United Nations, and you intend to expand your activities, study all the phases of what can be done to control outer space, and then present it, I suppose, to the group of nations as we gather within the United Nations.

Am I correct in that?

Dr. WILCOX. That is correct, Mr. Riehlman.

Mr. RIEHLMAN. Of course we have no international law at this time that would deal with that type of situation, have we?

Dr. WILCOX. No, sir, the rules of international law are quite incomplete in this area.

Mr. RIEHLMAN. If you do not have the cooperation from a major nation, such as has been discussed by our chairman, just exactly how are we going to enforce the situation? If we can establish some law that the other nations are interested in within the United Nations, how are we going to police it?

Dr. WILCOX. Well, sir, that does raise, of course, the central problem involved here. You appreciate, Mr. Riehlman, that there are two aspects of the problem of outer space. One is to encourage the use of outer space for peaceful purposes. The obverse side of the coin is to take those steps necessary to make sure that outer space will not be used for wartime purposes or warlike purposes.

All we have done in this first venture is to move ahead with rather modest steps to encourage cooperation among nations in developing outer space for peaceful purposes.

We have deliberately disassociated this step from the other necessary step that must also be taken, at some time, to control the use of outer space so that it won't be used for warlike purposes.

It is our thought that we did not want to get this first step bogged down in the complexities that are involved in the establishment of the control and inspection systems necessary for any effective disarmament program. We want to move ahead first in the peaceful uses of outer space with the thought that if you get cooperation here, then it might encourage cooperation in the other areas that you spoke of.

Mr. RIEHLMAN. Certainly whoever gets control of outer space is going to control military activities. Isn't that true?

Dr. WILCOX. Yes, sir, and we quite appreciate that this is a very important aspect of the problem. But we do think in this instance, first things ought to come first. We will see what we can do here, and then hope we can make some progress on the other side of the problem.

Mr. RIEHLMAN. We are anticipating putting a man into space within the next year or two probably. What would happen if a man in space were forced to land in a foreign nation, an unfriendly nation?

Dr. WILCOX. Mr. Becker is equipped to make some comments on that problem. He is here. He is our legal adviser and I understand he will be the next witness before the committee.

The CHAIRMAN. He is the next witness, yes.

Dr. WILCOX. I think he would be willing to answer your question. This is one of the problems I raised, Mr. Riehlman. I am not sure whether you were in the room at the time I mentioned it in my paper, but I indicated that the question of manned space flight was one of the many problems that the United Nations might possibly be helpful in resolving. This whole question of reentry and whether you can control reentry and what rules and regulations are available is certainly a very important one.

Mr. RIEHLMAN. That should be very high on your agenda when you meet with the other nations in this group.

Dr. WILCOX. Yes, sir.

Mr. RIEHLMAN. Mr. Chairman, I will pass on.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. Doctor, there are only two things perhaps that are limitless. That is time and space. As I get it, you realize and you understand our position. We have to creep before we can walk. We are merely in a creeping stage now in the matter of space and space law. We can progress with a certain celerity, if we go slowly and lay the proper foundation for this law. Is that correct?

Dr. WILCOX. That is correct.

Mr. MILLER. We can't anticipate what the future holds in these fields. So if we go slowly at a time when these things are important to our future, if we do not get the proper foundation, it could cause trouble in the world for quite some time to come. Isn't that true?

Perhaps if we do go ahead even on a positive program without Russia, perhaps pressure in Russia from her own scientists who recognize this will eventually force her to come into a family of nations—world opinion.

Am I right in that assumption?

Dr. WILCOX. You are exactly right. The fact that a large majority of the members of the United Nations approved this resolution is indicative of the possibility that eventually the Soviet Union may well yield to the pressure of world opinion and join its efforts with the other members of the United Nations in this important venture.

They did this, you recall, in the case of the International Atomic Energy Agency. For a long time they withheld their approval and disagreed with us. Then eventually they signed up and became a member of the Agency.

Mr. MILLER. I was talking to a man this morning from one of the other departments of Government who does research in this field. He tells me that in connection with the International Geophysical Year, particularly in the field of oceanography, the Russians are so proud of what they have done that they are leaning over backward to impress our scientists. They want to show them that they can meet them on an equal basis—that is, scientist to scientist. They are not trying to use heavy tactics. They want to show that they are also people with some knowledge.

Is that true?

Dr. WILCOX. Yes, sir. In the International Geophysical Year program the Soviet Union cooperated very well in many areas of science. It is very true they did not agree to cooperate in connection with the IGY's outer space program, but they did in many other areas, and in a very satisfactory way.

I think that our scientists would agree that the IGY was one of the most useful and fruitful things that has happened in our generation.

Mr. MILLER. In the field of science, isn't it true that the Russians are beginning to break down and come in? Don't the scientists themselves indicate they would like to go along with the rest of the people in their own field because they have come to the realization that knowledge isn't limited by international boundaries; it is a common thing? Is that correct?

Dr. WILCOX. Yes, sir, I think that is true. That has been, I think, in evidence in our work in the World Health Organization, where political considerations have not played, I think, a very prominent part in Russian participation.

I must say, however, that in the United Nations when this resolution was being considered, the Soviet Union did inject political considerations. They tied it up with our withdrawal from foreign bases and a "ban the bomb" propaganda campaign, and things of that sort, which they knew would complicate the question and which we were very sorry about. We hoped we could proceed in this area without injecting political differences of that kind.

The CHAIRMAN. Mr. Anfuso.

Mr. ANFUSO. Dr. Wilcox, I too want to congratulate you on your very fine statement. You and I have spoken at some international meetings in New York, and I recall very well your learning on this subject.

I think that my colleague from California—although not a lawyer, he is a very wise man—put his finger at the heart of this thing when he said we are in a creeping stage. We are not ready to police anything, are we?

Dr. WILCOX. No, sir. We have made quite clear that we would be willing to move in the direction of an international inspection system in this field, assuming that the technical experts after a meeting such as was held in Geneva in connection with nuclear testing, found it was feasible to establish such a system.

This would be the first step. Then following that, we would see to what extent agreement might be reached.

We have made it quite clear that we are ready to move in the direction of protecting the use of outer space against warlike purposes, and preserving it for peaceful uses.

The President made this offer in his letter to Mr. Bulganin, and over a year ago our representative in the U.N., Ambassador Lodge, made a similar offer.

Mr. ANFUSO. You yourself in your prepared statement put it very well when you said that here is a time when the ingenuity of man can be utilized to peacefully explore outer space for the benefit of man. You said there should be no rivalry in this direction.

Therefore I would take it from your statement that we ought to do everything in our power to exchange information on the subject with other friendly nations and all countries seeking to cooperate; to recruit scientists wherever we can; and to do everything possible to get the ingenuity of man, regardless of where he comes from, to come up with something so that outer space will be used for the benefit of the world and be beneficial to all mankind.

Isn't that your objective?

Dr. WILCOX. Yes, sir, and much better stated than I could have done.

Mr. ANFUSO. I don't think so, but I thank you. Do you also see in this a great propaganda vehicle for the United States? You know we have been criticized in the past for always being second. Russia starts something and we follow.

Here is something in which we can actually take the lead and use it as a great propaganda weapon. We are not interested in destroying anybody, but we are interested in exploring space so that it can be used by everybody for peaceful purposes. That is a great weapon, isn't it?

Dr. WILCOX. Yes, sir. I don't know whether I would necessarily call it a propaganda weapon, although certainly it would have great propaganda benefits from our point of view. When we put our time and energy into the achievement of great goals and ideals of this kind which are designed to benefit all mankind, certainly nobody can complain and most people ought to applaud what we are doing.

Mr. ANFUSO. Regardless of what we call it, that kind of an approach will appeal to men everywhere, won't it?

Dr. WILCOX. Yes.

Mr. ANFUSO. It would appeal not only to scientists but to human beings throughout the world. I like your statement when you insist that nongovernmental organizations should definitely be in this field. I can't agree with you more. If we can get foreign organizations

and foreign scientists who are interested in the peaceful exploration of outer space, and they are doing work on a voluntary basis in that direction, we should welcome them, shouldn't we?

Dr. WILCOX. Yes; very definitely. I think there was some concern for awhile that a United Nations program might have an adverse impact upon the work that was being done in the nongovernmental scientific organizations.

But I want to assure you, sir, and the committee that it certainly was not our intention to do anything at all to impede the work of these organizations or to place any obstacles in their way. Indeed, it is my judgment that the creation of United Nations machinery in this field will have the opposite effect. I think it will encourage and stimulate further action by scientific bodies.

The CHAIRMAN. Will the gentleman yield?

Mr. ANFUSO. Yes, indeed.

The CHAIRMAN. It would seem to me that peaceful use of outer space not only has a tremendous propaganda value, but from a purely nationalistic standpoint, for the benefit of our own people. About the only way our land can be hurt by Russia, in the event of anger, is through outer space.

You take away the ballistic missiles; you take away the satellites and the rockets, and we can keep our own Nation impervious, more or less, to attack. Isn't that true?

So we have not only propaganda value but we also have a very strong nationalistic reason for wishing to make outer space peaceful.

Dr. WILCOX. Certainly, Mr. Chairman. It would be very helpful to the cause of world peace and to the security of all nations if steps could be taken now to control outer space before countries begin to use outer space in a harmful way.

The CHAIRMAN. I am talking on a defensive matter, too, am I not?

Dr. WILCOX. Yes, sir.

The CHAIRMAN. As I say—again looking at it purely in terms of the best defense for this Nation—it is far better to have outer space for peaceful uses alone.

Mr. ANFUSO. I certainly agree with the chairman. I am sure you do, too, don't you, Dr. Wilcox?

Dr. WILCOX. Yes. This could of course raise problems, as you are aware, about the nature of our defense efforts. I would prefer to have defense experts speak to this problem. I certainly agree that the steps which we have offered to take to move in the direction of adequate inspection and control are very important for us and for the peace of the world.

The CHAIRMAN. Will the gentleman yield again?

Mr. ANFUSO. Yes.

The CHAIRMAN. If we barred, for instance, the use of satellites; if we barred the use of intercontinental ballistic missiles, a great deal of the fear of this country being hurt would be eliminated. Isn't that true?

Dr. WILCOX. Yes, very definitely.

The CHAIRMAN. So from a nationalistic viewpoint, it certainly is a fine thing to do. The reason I mentioned that is because when I was talking to Dr. Wilcox a little earlier, he indicated some degree of uncertainty as to whether or not I would go all out on the peaceful use of outer space.

I think from a nationalistic viewpoint and from a propaganda viewpoint it is the finest program we can get for the use of outer space.

Dr. WILCOX. I think, Mr. Chairman, I did that in a rather jocular way as we were having our picture taken and as you pointed to that particular phrase in my remarks. I did not mean to imply you would not agree that outer space should be used only for peaceful purposes.

Mr. ANFUSO. Dr. Wilcox, I like the position you are taking. You come here in the posture of a man of peace. You are trying to divest yourself from military aspects, and I can understand that. When I refer to you as a man of peace, I contrast you entirely with that man over in Russia who is always talking peace but practicing something else.

But your intentions are all for the good of mankind. You mentioned something, in answer to the chairman, that it is important for us to try to establish agreements as soon as possible because, if we don't, later on we may be in chaos, or words to that effect.

Is that correct, sir?

Dr. WILCOX. Yes, sir.

Mr. ANFUSO. The U.N. has made a noble beginning in what it is doing. But it is also important, in addition to that, that we try to establish agreements not only with friendly nations but make every effort to establish an agreement with Russia. Would you agree with that, sir?

Dr. WILCOX. Yes, very definitely.

Mr. ANFUSO. In other words, this committee, the administration, and the whole Government of the United States, has a tremendous challenge here to try to do something in that field. Otherwise we may be in the danger that my colleague from New York, Mr. Riehlman, said that we would be in, trying to establish these agreements.

In trying to establish these agreements, I would say that we should go all out in feeling out our own friendly nations, get their views, get their ideas as to what they think should be done—always speaking about the peaceful aspects.

And at the same time we should bend every effort to seek contact, immediate contact if that is possible, with Russia and say, "We want to talk this thing over with you. We want to discuss the peaceful aspects of this, but you object to talking about it. If you don't object, then let's talk about it. Let's get your views and let the world know your views, as we are prepared to let the world know our views."

Do you agree with that?

Dr. WILCOX. Yes, indeed, as I mentioned a moment ago, we did make very strenuous efforts in New York to reconcile the Soviet view with that of the great majority of the United Nations. The fact was, however, that the Soviet Union apparently wanted to dictate the exact composition of this committee. Normally, as you know, in the United Nations a committee of this kind will reflect the different groups in the United Nations. Representatives from Latin America, from Western Europe, from the Soviet bloc, from Asia, from Africa and so on will be appointed.

This is the normal operating procedure in the United Nations.

Normally the groups involved determine to a large extent what countries are best equipped to represent them on such a committee.

It is a very unusual procedure to have any one country attempt to dictate who should sit on a United Nations committee.

I think, if I may say so, this reflects the basic Soviet attitute which has been prevalent ever since the beginning of the United Nations, that really there are two great groups here—the United States and the countries with which we maintain alliances and friendly relations, and the Soviet Union and its bloc.

They would prefer to deal on that basis rather than to accept the recommendations of a representative group in the United Nations.

Mr. ANFUSO. Dr. Wilcox, I can understand that, and I am sure you do. What the Russians are doing in the United Nations is playing power politics. If you are going to have an organization, they want to be able to say, "Well, I want this side to be filled this way; and if you want to fill your side that way, I want my side this way."

They are playing power politics and at the same time keeping their satellite countries happy and also creating propaganda as far as China is concerned and saying, "Here, now, if we continue to do this, maybe we will get you in."

They are strictly playing power politics. Therefore, I sincerely believe that a lot more perhaps, can be done in this direct approach to negotiations. I think in the foreseeable future that this is a better approach—exercising all the force of the United Nations and a committee of Congress cooperating with the United Nations.

Would you agree with me?

Dr. WILCOX. I appreciate your suggestion along that line and I think it is very valid.

Mr. ANFUSO. I have one last question. You have stated a rather concrete position which is understandable by this committee. Does your statement represent a change in administration policy?

Mr. WILCOX. No, sir, I don't think so.

Mr. ANFUSO. Before you answer that, I might say for the purpose of clarification that we had Senator Keating of New York here yesterday. My recollection was that he favored international agreements as soon as possible.

But assuming that others believe we should go slow, is that the administration's policy?

Dr. WILCOX. We want to make haste slowly, if I can put it that way. I think Mr. Becker will explain the reasons why it is maybe unwise to enter precipitously into agreements which will codify and stabilize rules of conduct with respect to the use of outer space very soon.

Mr. ANFUSO. Can I interrupt you for a minute?

Dr. WILCOX. Yes, indeed.

Mr. ANFUSO. There is an Italian expression which says if you go slow, you will go long and far. Is that what you are trying to say?

Dr. WILCOX. We think it is perhaps better to move somewhat cautiously in this field until we know more. That is the main purpose of the survey that the United Nations committee will undertake.

I don't think the position that I have stated does represent any change in our policy. Mr. Dulles, before the Press Club a year ago, made very clear that we were prepared to work through the United Nations in connection with the peaceful uses of outer space; and as I

pointed out earlier, on several occasions the President, Ambassador Lodge, and others have stated that it is our policy to do what we can to preserve the use of outer space for peaceful purposes and to take steps to protect it against use for wartime purposes.

Generally, I think what I have outlined here is quite consistent with what our policy has been.

Mr. ANFUSO. Would you say that this is the administration policy, that we should go all out, as you have said yourself, to establish contacts, to try to make agreements, but not to take a belligerent attitude in the event we don't meet with first success?

Dr. WILCOX. Oh, yes, indeed.

Mr. ANFUSO. But to be persistent and persistent until we do arrive at an agreement. Would you say that would be good administration policy?

Dr. WILCOX. Yes, sir. I think persistence is one of the attributes that we ought to continue to adhere to in attempting to work these things out, because we have found that if we get impatient in our negotiations with the Soviet Union, we won't get very far.

Persistence above everything else, assuming that we have a good policy to begin with, then we must be persistent in our attempt to work it out.

Mr. ANFUSO. I thank you. Thank you, Mr. Chairman.

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. I want to say to the good doctor, we are glad to have you here. It is a very stimulating occasion any time we have the opportunity to discuss these matters with you.

Dr. WILCOX. Thank you very much.

Mr. FULTON. He likewise is a personal friend. I would like to bring up the appointment of the Study Committee under the U.N. resolution of December 12, and ask you about the implementation by the U.S. Government.

Have we yet, through our Government, appointed the delegates or the members of the Committee to represent us?

Dr. WILCOX. Yes; we have. I referred to them briefly in my statement.

Mr. FULTON. How many are there and how many places are open yet?

Dr. WILCOX. The delegation is complete, Mr. Fulton. Ambassador Lodge will be our chief representative. Dr. Hugh Dryden will be our leading scientist in the delegation. In the legal field, our own legal adviser, Mr. Loftus Becker, who is here this morning will serve. And Mr. Barco, who is our minister in the mission in New York, will serve as deputy to Mr. Lodge on the organizational and political side.

Mr. FULTON. That will make how many members in all?

Dr. WILCOX. Four altogether. It is not anticipated that all four of them will be necessary at any one time; but in the event Ambassador Lodge is away, the deputy chief of mission, Mr. Barco, would represent the United States on the organizational and political side, and Dr. Dryden and Mr. Becker on the scientific and the legal side.

Mr. FULTON. How has the implementation been for other countries who are members of the Study Committee of the U.N. under the December resolution?

Dr. WILCOX. Well, sir, it is a little hard to say because in some cases they have not indicated what they intend to do. And, of course, the committee has not yet been convened. My understanding is that a number of them will ask their permanent representative in New York to represent them, at least in the organizational stages of the Committee's work.

After that they will probably need some scientific advisers and legal advisers.

Mr. FULTON. Has there been any organizational work done in looking toward the organization of the Study Committee of the U.N.?

Dr. WILCOX. We have been doing some work in our Government in collaboration with the scientists and others interested in this problem, merely to indicate the kinds of things the Committee might wish to do. Of course, the Committee will be the master of its own procedures, and it will have to determine, after it meets, just how it intends to proceed.

But we have been moving ahead in the preparation of four working papers so that we will be ready to make a useful contribution to the work of the Committee.

Mr. FULTON. I wanted to know what kind of a study is being worked out by the U.S. Government to implement policy; the four areas that are to be studied under the U.N. resolution. How are we developing that policy?

Dr. WILCOX. Well, sir, as I have explained, we are preparing four working papers which will indicate in broad lines the kinds of things we think the Committee might usefully do. As I pointed out earlier, however, this is really only an inventory. It is not a statement of well-defined policies. Nor is it intended to be such.

Mr. FULTON. I have talked with Dr. John Cobb Cooper of Princeton about the method of coming up with that policy. Don't you think there should be some sort of a study committee, or resolution introduced, that would give it a broad base in various levels of government and also from science and the economy of the country, both labor and management?

It is policy formation, looking into a study to see how the United States proceeds at the U.N. level into space. Certainly, to me, I would think there should be a formalized study made, not just at the departmental level.

Dr. WILCOX. Yes, sir; I think that is correct. The scientific groups and others are being consulted in the preparation of these studies.

Mr. FULTON. Would you object to a congressional resolution along those lines that I have talked over with Professor Cooper of the Princeton Institute of Advanced Studies?

Dr. WILCOX. I would want to see the text of it. Generally speaking, I would not think it objectionable at all. It might very well be helpful as indicating congressional support for the kinds of things that the Committee might be doing.

Mr. FULTON. It would tie this committee in, as well as the Senate committee and other committees that are interested—possibly Foreign Affairs, Appropriations, and Finance Committees; and likewise it might tie in members of the Security Council or the Council of NASA.

Mr. ANFUSO. Will you yield a minute?

Mr. FULTON. I will yield.

Mr. ANFUSO. Are you thinking of adding a congressional advisory committee to it or to form a part of it?

Mr. FULTON. To form a part of it.

Mr. ANFUSO. I agree with you. I can't agree with you more.

Mr. FULTON. May we go just a little bit further about what might be done under the United Nations. The question to me would first come up whether we could—I believe Mr. McCormack had mentioned this—approach the International Court of Justice. Under article 92 of the United Nations Charter, all the United Nations members are automatically members of the International Court of Justice as a successor to the former Court of International Justice.

That would mean the Soviets are members as well as Poland, representing the satellite countries behind the Iron Curtain.

We could then at that level, if we were able to take any question of a dispute before the International Court of Justice, have a tribunal that could decide some of these things that might be legal or jurisdictional questions. Why wouldn't that be an approach?

I disagreed with Mr. McCormack on using it for something like Berlin, because if you used it for Berlin on the basis that you would have an easement out: How about Switzerland? How about Australia? How about Paraguay? How about Outer Mongolia?

You can get into a vast number of diversions by that kind of an approach.

The query: If you transposed the idea and said let us put the development of the decisions on space under the International Court of Justice, you would then have every member of the United Nations as a party to any decision that has been made, or that would be made.

Dr. WILCOX. That is an interesting proposition, Mr. Fulton. It certainly deserves study—the extent to which the Court might play a role in the development of international law in peaceful uses of outer space.

I would like to have Mr. Becker, when he appears, comment on that. My initial reaction is that it would depend on how the proposition is presented to the Court. The Court normally considers cases or controversies, although it does have authority—as you know—to render advisory opinions at the request of the Assembly or the Security Council or other agencies of the United Nations. There are two ways, therefore, in which the Court might be used.

The precise manner in which the Court was approached and the problems that would be involved would have to be subject to very careful study.

The CHAIRMAN. Will the gentleman yield?

Mr. FULTON. Yes.

The CHAIRMAN. You referred to Mr. Becker. My thought is this. It is 11:25 and I have no reference to questions being asked at this time; but since you referred to him and his statement, we had planned on not having an afternoon session if it could be avoided.

What would the committee think of having the statement of Mr. Becker; and then we will let the members question both of them at the same time, in the interest of speeding up and getting through this morning.

Mr. FULTON. Bring Mr. Becker up right now. I want to ask some questions on the charter.

The CHAIRMAN. I think the proper thing to do would be to have his statement first and then proceed.

Mr. FULTON. Could I just finish first?

The CHAIRMAN. You go ahead and we will ask Mr. Becker to come forward. He could sit there with the doctor so they can both be available to the members. From now on you have two witnesses to question rather than one.

Mr. FULTON. I believe the good doctor will remember in 1946 when we acceded to the International Court of Justice that there remained under the jurisdiction of the United States things that should not apply to any domestic matter as determined by the United States itself.

But even with that kind of a limitation, space law would not keep us, in the United States, from being able to give an exclusive and a compelling jurisdiction.

Under our present accession to the International Court of Justice, we in the United States would be bound by the decision of the Court on space law. Isn't that right?

Dr. WILCOX. This probably is more properly Mr. Becker's question. We could, of course, in any agreement to which we are a party, indicate that disputes relating to the agreement should be referred to the Court; and in advance we could give it compulsory jurisdiction over that type of a dispute.

Mr. FULTON. What I am pointing out is: It would not involve a change of position in the United States, since its accession to the International Court of Justice in 1946, to have the International Court handle the space issues because they do not involve our internal jurisdiction. Is that not right?

Mr. BECKER. I don't want to give an abstract answer to that, Mr. Fulton, because I would want to see the context in which that case arose. I think your real problem with respect to the Court is how do you get Russia into the Court. I have brought about five cases against Russia, and I haven't gotten them in yet because there is also article 36 of the United Nations Charter, and Russia has not filed a submission to the compulsory jurisdiction of the Court.

So as each case rises, Russia determines in its own individual way as to whether it will come into court. I filed a number of suits with respect to our planes that have been shot down by Russia.

Not once have they submitted to the jurisdiction of the International Court.

Mr. FULTON. Don't we have a case right now with Bulgaria? Isn't Bulgaria submitting itself?

Mr. BECKER. That is a different case. It is different from Russia in that the prior Bulgarian Government in 1920 submitted itself to the compulsory jurisdiction of the permanent Court of Justice which was the predecessor of the International Court of Justice.

It was provided in the Charter that the submissions to the permanent court would continue under the International Court. Probably through oversight the Communist Bulgarian Government has never withdrawn that compulsory submission.

That is different from the case of Russia because they do not have a compulsory submission.

Mr. FULTON. Does the International Court of Justice then proceed with the U.S.S.R. sitting in on all the decisions when it will not submit itself as a state to the compulsory jurisdiction of the Court?

Mr. BECKER. There is a Soviet national on the Court, but this is a question of whether they are going to submit to the compulsory jurisdiction of the Court, which is entirely different. It is within their power to agree or not to agree to submit to a specific case.

That is the specific provision of article 36.

Mr. FULTON. Russia has never yet given that compulsory jurisdiction?

Mr. BECKER. It has not.

The CHAIRMAN. There is no way to make Russia comply with a decision unless it does give its consent to compulsary use?

Mr. BECKER. That is correct, sir. Each of these cases, after a reasonable amount of time when they refuse, is dismissed.

Mr. FULTON. Of course, if I could comment there, a member who is dissatisfied with the decision or wants to enforce a decision, can appeal the decision to the Security Council and there Russia could veto.

Mr. BECKER. That is correct. I must say that the history of the Court has been rather encouraging in the fact that, once countries agree to go into the Court, they almost invariably comply with any direction that the Court makes.

Mr. FULTON. Let's go a little bit further——

The CHAIRMAN. Why not have his statement now so we can see his viewpoint generally and then we can proceed with the questioning? What we are doing now is going at it backward because Mr. Becker's statement hasn't been made, and yet we are questioning him on a statement that he hasn't made.

Mr. FULTON. I just want to finish something on Communist China on this one point. Because nations that are not members of the U.N., nor a party to the statute of the International Court of Justice, can nevertheless be brought in on individual instances, it would be possible really to bring Communist China into a setup under the International Court of Justice for outer space law without making them a member of the United Nations or without recognizing them on the part of the United States; wouldn't it?

Mr. BECKER. There is a question there, because it is provided in the charter that only states may be litigants in the Court. We do not recognize Communist China as a state.

The CHAIRMAN. Will you proceed with your statement, Mr. Becker?

STATEMENT OF LOFTUS BECKER, LEGAL ADVISER, DEPARTMENT OF STATE

Mr. BECKER. Mr. Chairman, members of the committee, I don't have a written, formal statement; but I will speak from notes.

I very greatly appreciate the opportunity of appearing before you. I appreciate it particularly because apparently in my prior appearance and some of the other statements that I have made on the law of outer space, I haven't put over the real position that I hold.

In general, it has apparently been thought that my position with respect to outer space law is completely negative, and that I don't want anything to be done.

It is my own inability to get across my point, but that is not a true statement of my position. I do have certain negative aspects in my thinking.

In the first place, I do not think this is the time to draw up an overall code of outer space. If I may poke a little fun at my own profession, we lawyers are very much inclined to be specialists. We each like to have a mystery. There are antitrust lawyers and tax lawyers and real estate lawyers, and so on.

I think that there is coming into being a group of lawyers who think of themselves as space lawyers. But I don't entirely hold with the view that there need be in many areas a particular rule with respect to space because, after all, when man and his objects go into space they are going to carry their codes of conduct with them.

We have a number of rules and we have a number of mechanisms that are already working very well now. I think it would be very unwise to distinguish space from all other things in all respects.

Second, I don't think that now is the time to have a general international conference, as some have suggested, to codify the law of space. I am fully in accord with the approach that has been taken by the United States, as indicated by Dr. Wilcox, in the United Nations.

I think this is a very constructive step. I think we do need an inventory of the problems with respect to the legal aspects of outer space, as well as the scientific aspects.

I had some question initially because we do have an existing body in the International Law Commission of the United Nations where you do have specialized legal experts. That might have been an alternate way to deal with it, but I am satisfied that other nations in general, as far as their capabilities will permit, will follow the lead of the United States in attaching to their delegation, as far as they are able, specialists in this particular field.

Finally, I don't feel the sense of urgency that we have to get moving as quickly as some other people do. In the first place, I have repeatedly stated that any sound body of law is based on a system of experienced and known facts. There are a great deal of facts that we just don't know at the present time with respect to outer space and the conditions there existing.

Second, in a number of areas we do have some perfectly adequate mechanisms that are working and will produce rules that will be just as applicable in outer space as they are on the earth.

Third, I can see an attempt to move too fast in this field as stimulating conflict rather than agreement.

Finally, as has already been indicated here this morning, there is no magic in a rule. The very nature of international law is that it is consensual. And unless a nation agrees it will be bound by a particular rule, it doesn't help you a great deal to have the rule.

Those are the negative aspects of my position. I would like to turn now to the affirmative aspects, because I think they are very important.

In the first place, I heartily support cooperation in the outer space field. Through that very cooperation we will of necessity develop a number of rules designed to avoid conflict and interference and mutual forbearance.

That can go forward even without the Soviet Union, but I heartily share the view of the gentleman who said a little earlier that in the course of time the Russians will feel impelled to join in that effort and perhaps we can get agreement more quickly by proceeding in that manner than by calling an international conference that the Soviets refuse to attend.

Now, as to the nature of the problems that we should study, in the first place, I do not think we should start out on the delimitation of air space as distinguished from outer space. I am very well aware that there are those who argue that we should immediately say that our air space stops at a certain point, and that beyond that point everybody is free.

We have a term in international law called res communes which means an object belonging to everyone and capable of appropriation by no one.

As an example of that, the high seas are res communes. They are the property of everybody. I think this is important because the very fact that everybody owns it means that they have an affirmative right to it which cannot be appropriated, as distinguished from merely a negative right.

If I could coin a term, there are some people who argue that outer space should be regarded as "ether communes." I don't think we have reached the point of determining such a broad general rule.

The CHAIRMAN. What would you think of a word "aerospace"?

Mr. BECKER. Pardon?

The CHAIRMAN. What would you think of a word "aerospace"?

Mr. BECKER. It is a perfectly sound term, except that there are areas when you finally get out where there isn't any air.

I think there is some danger in taking a position at that point at this time. After all, if you adopt a principle of international law and other nations do not, you may find yourself estopped; whereas they are not estopped to make claims with respect to that particular area.

I don't think, however, that the fact that we don't now sit down and try to define the outer limits of air space and therefore the outer limits of U.S. sovereignty that we need stop our thinking.

I would approach it instead along this line. We have and can foresee at this moment very definite problems with respect to orbiting objects. I use orbiting objects to distinguish them from the type of object that goes from the surface of the Earth and returns to the Earth, and also from probes that go out into outer space and perhaps go around the Moon or go around the Sun.

I may say that I regard with a certain amount of complacency the possibility that there will be a collision between the Soviet satellite that is going around the Sun and the one that we put around the Sun the other day.

That problem is one that I am not prepared to devote my present thought and effort to solving.

But I do think that we could very well and we already are devoting some serious thought to what types of orbiting objects should be permitted without restriction, and what types should not be permitted. We have already initiated within the Government consideration of a proposal in that regard, and if you gentlemen would permit me to at

some later time go into executive session, I would like to give you the information about it. Because it is in the course of formulation, I don't feel free to discuss it in open session.

But there is one area where some real progress can be made.

I have seen a lot of people who say that we have to get some special body or some special meeting in order to develop rules with respect to communications to and from outer space and around outer space. I think that suggestion really fails to take into account what actually is going on today and has been going on for some time.

The Department of State organized over 2 years ago a preparatory committee to assist in the development of the U.S. position for the forthcoming Administrative Radio Conference of the International Telecommunications Union, which is usually referred to as ITU.

In that they took into consideration requirements for space communications and the U.S. proposals to be sent to the ITU for distribution to the members of the union prior to the convening of the conference reflect this fact.

The U.S. proposals include definitions for such items as objects in space, earth space service, space service, earth station, space station, and so forth. And provision is made in the proposed frequency allocation table for the operation of these services.

I may say that the Soviet Union is an active participating member in the ITU.

An exclusive band has been proposed for space communications in the 25-megacycle band, and bands shared with other services in other parts of the spectrum. That is to say, 1,700, 1,800, 2,200, 8,300, 15,000, and 31,500 megacycles. It is the consensus of the preparatory committee that these allocations will satisfy the requirements for space communications to the extent practicable at this time.

This view is also shared by the Interdepartment Radio Advisory Committee—IRAC—and by the Federal Communications Commission, the FCC.

In the event that any further requirements for space communications develop, appropriate action will be taken in that regard.

The ITU Radio Conference is scheduled to convene in Geneva on August 17, 1959. That will review and revise, as necessary, the currently effective international radio regulations drawn up at Atlantic City in 1947.

The review of the regulations by the Conference will include study of the frequency allocation table and will undoubtedly result in revision of the table, including provision for space communications for which no provision is made in the current regulations which were formulated in 1947.

There, as I trust you see, a problem is currently being met with an existing mechanism and there is no need for any special space organization or body.

You have the problem of landing objects. Let me suggest a hypothetical case in that area. Assume that there was an error in the guidance system at Cape Canaveral, and also a failure of the explosive mechanism that is designed to destroy a missile that is off course. And instead of heading out over the ocean, this particular missile loops back and lands in the middle of the United States.

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I suggest that we have existing law and courts which are perfectly capable of dealing with the resulting legal problem. We have a very well developed tort law which includes the concept of liability in the case of dangerous instrumentalities.

We have a Court of Claims in which it is open to any citizen who has been damaged by any act of the United States to bring suit against the United States and be compensated.

In the international sphere, is there any basic difference if that particular damage occurs as a result of the landing in the United States of an object that was intended to orbit?

Basically I don't think there is. I think that there would be international liability in that case on common principles recognized both in the law of the United States and in the civil law systems—and in international law, I may say.

Mr. ANFUSO. Will you yield?

The CHAIRMAN. Will the gentleman yield?

Mr. BECKER. I certainly will.

Mr. ANFUSO. In that particular case, where would you sue?

Mr. BECKER. One place to sue would be in the International Court of Justice. The basic problem there in international law in obtaining redress for that type of action is to find some place that you can make it stick.

Mr. ANFUSO. Just a minute. Supposing that was a Russian object and could be identified as a Russian object which fell on American territory, you said you would sue in the International Court and Russia wouldn't recognize it.

Mr. BECKER. That's right. In other words, you have the law but you don't have the will to obey the law. There are all sorts of outstanding recommendations in the United Nations, moreover, that the Russians refuse to follow.

The basic problem there is how to get them to agree to come in and be bound.

It is not for lack of law. The only point I make, if we look around at these problems, we will find that we are further advanced than we think we are; and in some areas, our effort should be directed not toward exercising our legal ingenuity in order to devise abstract theories or rules, but rather in doing just what Dr. Wilcox is doing—trying to get these people to agree and come along with us and cooperate, because I think cooperation is much more important at this time than the devising of additional rules.

Then some people have raised a question as to what would happen were the Soviet Union to put a red flag on the moon. I can assure you that putting a red flag on the moon does not give the Soviet Union the right to the moon. In order to obtain territory even under our domestic law or international law, you have to do a great deal more than putting an object on anything in order to obtain rights with respect to it.

I think the question of actually taking over areas of the moon is considerably in the distance, and we will have dealt with that problem possibly through this United Nations mechanism or some other way before the question really becomes a vital and urgent one.

I repeat, I think there is a sound reason why our courts refuse to answer hypothetical questions. They want to know what the cir-

cumstances are before they devise a rule, and I think we could have a bit of this thinking in our space area.

I would say, and here I would like to just give you three catch words, because I think they are the basic problems of space law that we are going to have to solve. I have put them down here as three words: "Innocence"; "Identification"; and "Indemnity."

Innocence—by that I mean that we are probably going to have to work out ultimately some system of advance notice of a course of firing and orbit. That may in some cases even go so far as to involve an inspection.

The purpose of that is to advance the objective that Dr. Wilcox has already indicated, to insure that space is being used only for peaceful purposes and to avoid needless conflict in space. Then we have——

The CHAIRMAN. Would you also say to avoid damage to others—other peoples, other nations?

Mr. BECKER. Yes; I think that is correct, sir. Then the problem of identification. There is a saturation problem there, I believe. There is also a problem of identifying, if damage is caused, who caused the damage.

Finally there is the problem of indemnity. I think we have a reasonable basis in law right now as far as that is concerned. We may want to develop it further and make some rule as to absolute liability or even provide some form of insurance because in some instances the damage may be very great.

Mr. ANFUSO. Will you just yield there for a clarifying question?

Mr. BECKER. Certainly.

Mr. ANFUSO. I understand your position very clearly. You speak about cooperation as being a lot more essential than getting law which other countries may not follow. One state recognizing the jurisdiction of another state.

In the case of the fallen object that I have mentioned to you, it would be far more important in your thinking to seek an understanding or agreement with Russia that she would at least recognize the International Court in the event of a fallen object as to who should pay damages to whom.

Mr. BECKER. That is right. That would be very helpful.

The CHAIRMAN. Proceed with your statement because we want to finish the statement before we start the questioning.

Mr. BECKER. I have just a few words more. Mr. Riehlman asked what would happen if this man in space landed in another country. Well, if he landed in the Soviet Union, I think we have the example of the C–130 case to indicate what would happen to him there. But I think we could argue that as long as he inflicted no damage, he would come under the general principle that where you have to land somewhere in order to save your life, it is generally recognized in international law that you have a right to do so as long as you are not indicating any aggressive purpose.

The CHAIRMAN. Except the Soviets don't recognize that, do they?

Mr. BECKER. Mr. Chairman, this is our common problem all the way through—to get them to agree to abide by the rules of international law. The only point I am making is that in many areas, international law as it presently exists would have an application to

objects that relate to space. And our basic problem is to get cooperation and agreement with the other nations that are engaged in such activities so that these rules can be implemented.

Thank you very much for listening to me so patiently.

The CHAIRMAN. Have you finished, Mr. Fulton?

Mr. FULTON. No, I have not.

The CHAIRMAN. I want to get to all of the members of the committee here this morning if I can. We have some who haven't said a word this morning.

Mr. FULTON. I will limit myself to 3 minutes.

The CHAIRMAN. Fine.

Mr. FULTON. The question comes up as to where sovereignty ends. We are of the position that it ends 3 miles out on the ocean. Where does it end in space, and why don't we need a rule on that immediately? Take the X–100 as the case. Suppose it can fly over another country or suppose Russia would put an X–100 across our country at the height of 100 miles. Are they violating our airspace?

Mr. BECKER. Mr. Fulton, the way I look at the problem is this: If we were to sit down today in order to try to define the height of our airspace for defense reasons we would probably want to put it so high that the result of it would only be to stimulate conflict, because then practically every orbiting object might well come within our airspace. And other nations would claim a similar right and you would have a dispute every time an orbiting object went around.

What I am suggesting, if I may finish, instead of engaging in needless debate of that type, let us indicate what type of orbiting objects may go around without regard to whether it happens to come within our airspace or not, because everything that goes into space comes through the airspace.

Mr. FULTON. I think though, I am in the school that feels the State Department should go faster in the development of the law of space. As I remember, as soon as John Selden of England came out with a book, Dominion of the Seas, it led up to the Spanish armada where he finally had to go higher and higher and eventually have a showdown.

I want to avoid that showdown.

So my feeling is to get the laws set.

Another thing is, suppose the Russians turn the moon red, which they could do, hit it with a lot of dust and turn it red as a propaganda stunt, what would we do? Do we have the right to go up there and put a white band and a blue band on it and make it red, white, and blue? Or suppose they get there first, are we going to be kept out of it? We should know. Or do we have the right to land on any planet we want to?

I will just finish with this. There is the International Law Commission. I want to say to the doctor: Why don't we, when we have 21 members there, appointed for 5 years under the United Nations, to work on problems such as the responsibility of States—why don't we put this in as a problem to the International Law Commission to work on? That is in existence until 1962 with the present members.

In addition, let me make another suggestion and I am through. Yesterday I spoke of the trusteeship council of the United Nations under article 75. My question is this: Why not put the problem of

space as a trustee matter under either article 83, which is a security trusteeship (Russia has agreed with us on the Caroline and Marshall Islands on such a security trusteeship) and that gives us the right to arm so each of us could have our security vehicles up there. Or put it under article 75, which would be a General Assembly trusteeship which would preclude any right to arm and declare it not a strategic area.

Why don't we make a move like that? I want some action. I think that the world, the country, feels that we should be moving on these various lines—not that we should come up with a permanent, ironclad, fastened-down code, but certainly we should be moving along these various directions that some of us are trying to suggest.

That is all.

Mr. MILLER. Will the gentleman yield?

Mr. FULTON. I am through. I yield the floor. My minutes are up.

The CHAIRMAN. I want to get around to Mr. Quigley.

Mr. QUIGLEY. I have no questions.

The CHAIRMAN. Mr. Karth?

Mr. KARTH. Mr. Chairman, I had several questions that I think were covered very well by Mr. Anfuso. However, on one of those, Dr. Wilcox, I believe, very strongly indicated that we have got to be on a comparative basis in the psychological warfare area with Russia just as well as we have got to be on a comparative basis with them on a so-called military warfare front. I think that Congress in its wisdom is going to take care of the military aspects of making the United States prepared for future, if necessary, wars with Russia.

But I do not think that Congress is in a position to do as much about psychological warfare as they are in a position to do something about military warfare. I think that this problem lies in the executive branch more than it does in the legislative branch.

I think it is especially important that we put emphasis on psychological warfare, especially when we are dealing with an enemy like Russia, for example, who are masters at psychological warfare.

So I am one who has always felt very strongly about the fact that sometimes we raise vast hypothetical questions and forget about some of the very basic things that we should be talking about—this area of psychological warfare.

I am one of those who feels that if we are going to be beaten by Russia, we are going to be beaten probably, more aptly, at least, in the psychological field rather than the military field.

Is this pretty generally stating the principle, sir, that you were expressing before this committee?

Dr. WILCOX. Yes, sir, I think so. I would alter it perhaps along these lines, that I would not want to put forth a proposition of this kind which has tremendous public appeal merely as a propaganda gimmick. I am sure you would agree. This is something we are sincere about, we are earnest about, we are honest about, and we really believe we can accomplish something for mankind.

Mr. KARTH. Yes, but along with the good that comes as a result of this extreme effort, of course, also comes the result that Mr. Anfuso talked about. It has a tremendous psychological effect on the rest of the world.

Dr. WILCOX. I think the byproducts will be extremely helpful.

Mr. ANFUSO. I think Dr. Wilcox is perfectly right in not identifying this as propaganda. You, as an elected official, and I, as an elected official, could probably so identify it, but you and I understand his position.

Dr. WILCOX. That is a very good point, sir.

Mr. KARTH. One more question, Doctor. If and when we accomplish international space law or agreements, and if these agreements should include such subjects as open radio frequencies, this, then, would really cause space to be less effective from a military standpoint, wouldn't it? If we had an international agreement that made all radio frequencies open to all of the countries who participate in this agreement, then really so-called highly classified or secret radio frequencies would be out the door and everyone would be entitled to know the frequencies that are being used with respect to a space vehicle, whether it be a satellite or otherwise.

So, in effect, space agreements, if they included this area, also, would make the military use of space less significant, would it not, and probably tend toward promoting this whole area that you are talking about—that is, that space should be used for peaceful purposes.

Dr. WILCOX. Yes, sir, I think that is right. That is one of the objectives which we have in mind in developing the peaceful uses of outer space. We hope that it would cause man to think more of the second step—that is, precluding the use of outer space for military purposes.

Mr. KARTH. Mr. Chairman, just in conclusion on the lighter side now, to rise to my own defense and that of my colleague from California, I want to say this—and I recall fairly well at least what Mr. Anfuso said. I think despite the fact that Mr. Anfuso is an attorney, he is a very knowledgeable man and a great asset to this committee.

I remember you said that despite the fact that Mr. Miller was not an attorney, he was very knowledgeable.

Mr. FULTON. He also has another asset. His daughter is being crowned queen this evening, isn't she?

The CHAIRMAN. This is a big day. Mr. Osmers?

Mr. OSMERS. Mr. Chairman, while we are on the lighter vein, I might make a comment on something that the gentleman from Pennsylvania, Mr. Fulton, said. If you do change the color of the moon, I hope they inform our romantic songwriters somewhat in advance because we will have a lot of changing to do with a red moon instead of a harvest moon.

Mr. Chairman, I assume it is well known to the committee that I am not a member of the bar and not knowledgeable either, so I don't fall into either category—the category of Mr. Anfuso or Mr. Miller.

The CHAIRMAN. Let's get ahead with the questioning. We want to finish.

Mr. OSMERS. I want to make this observation, Mr. Chairman, because I believe that we have missed it. We have missed the point a little bit in the legalistic discussion. To me, the development of law and practice as it governs space will be merely an extension of the relationships existing between the powers at the time the need arises. If we can't agree on the smallest matter of the jamming of radio channels in Europe, and if we can't agree on a matter like Berlin, and if

we can't agree on spheres of influence in certain fields of the Near East, for us to attempt to write a complete set of laws affecting outer space with Russia would seem to me a very, very large order, Mr. Chairman.

I would like to hear a comment on that from the State Department representatives.

Mr. BECKER. I couldn't agree more with that. I would say that the President's approach to this at the very outset to the Russians was an appeal for them in the outer space area to take a different attitude toward outer space. He pointed to the precedent of where in connection with the atomic development, we had at the very outset proposed disarmament in the atomic area. The Russians did not agree. He said to them in effect, in space we have another chance now. Don't take the same attitude that you had with respect to these other matters. Let's start off in some new area and get agreement.

It didn't work, but in the long run we may get some agreement in that area. Certainly, as Dr. Wilcox has indicated, you don't do these things overnight. The Russians ultimately did agree to an Austrian peace treaty, and we may get some agreement. I agree with your idea that it is too big an order to negotiate with them a whole code with respect to outer space, but I think if we go item by item we may get some agreement in this area.

Mr. OSMERS. Mr. Chairman, I want to urge our Government to use every resource to attempt to reach agreements in this field. However, I think the practical answer, sir, that you made to Mr. Riehlman's question about what happens if something specific occurs here, if a space vehicle or object that originated in another nation should land upon this Nation, or if the reverse of that should happen, we would be just where we are today on some of these other matters.

It would be entirely up to the nation to negotiate the matter.

Mr. BECKER. That is right.

The CHAIRMAN. Mr. Daddario.

Mr. DADDARIO. Doctor, when you said this is an area where international rivalry should not obtain and that this was the basis upon which this Committee was to be formed in the United Nations, don't you think it is asking too much both of the Soviet Union and ourselves to set aside international rivalries—even in this matter where international rivalries should not obtain—as you say, because of the propaganda effect of the alinement on committees of any nature, whether it be in this field or in any other?

Dr. WILCOX. I think what you say has a great deal of merit. I was thinking really of the harmful kind of rivalry which could lead to serious results. I was really trying to compare the kind of antagonisms that we have on earth with what might be possible in outer space.

We have a fresh start ahead of us here, and if we work on it and have the wisdom and the foresight to make some progress, we can perhaps avoid some of those antagonisms and elements of suspicion and distrust which have characterized our relations here on earth.

Mr. DADDARIO. Certainly we do have a fresh start, and yet in the alinement of nations generally, because they affect the problems which the United Nations has from day to day, our bloc and the Soviet bloc, and those in between, we would have to support nations for this Committee and so would the Soviet Union.

Therefore you would be building this Committee, which you say should be built, in this direction merely on international rivalries.

Dr. WILCOX. That is true in a sense, but where there is a will there is a way. If the Soviet Union wishes to carry on in the field of outer space in a highly competitive spirit, I assume it can do so.

Mr. DADDARIO. You said earlier you thought we could get ahead in this field because the IGY had been so successful. Why could we not still use that same type of formula to accomplish this end, in that it would not be tied in with the formula of rivalry which now exists within the structure of the United Nations.

Dr. WILCOX. Well, sir, I did point out that the Soviet Union did not cooperate in the IGY activities in the outer space field. It did cooperate in many other aspects of the IGY program. I would think that in any event we would want to utilize and to encourage the work of the scientific unions and the other groups interested in this field.

But as I pointed out earlier, I do think there are certain reasons why you have to have a minimal amount of intergovernment coordination and cooperation in this field.

Mr. DADDARIO. I just point out it is pretty difficult to divorce this from other problems. Mr. Becker, when you were pointing out the fact that there was no urgency in this situation so far as setting up the law, you said that any sound body of law is based on experience and known facts. Then later on in answering Mr. Anfuso, you said that there is lacking the will to obey.

Don't you leave out in both of those situations, especially in the sound facts and experience, that there always has to be the ability of some authority to enforce the law through precedent, through the experience that you have?

Mr. BECKER. That isn't the way that international law has developed actually, because pretty generally it has been consensual. You come back to the fact that in this field nations are very reluctant to give up any part of what they regard as their sovereignty.

For example, in San Francisco it was proposed in connection with the formulation of the charter of the Court that we have unlimited compulsory jurisdiction of the Court so that you wouldn't have any problem of submitting to compulsory jurisdiction.

It was the United States and the U.S.S.R. that defeated that proposal. Our representatives were unwilling to say that that Court had an absolute right to determine cases with respect to the United States. That is the type of problem you run into.

We have had a degree of law, and as I have indicated, a number of decisions have been made by the International Court and they have been obeyed. But there was no actual sanction that could be applied practically because, although there is, as has been indicated, a way of appealing to the Security Council, the veto in the Security Council is so employed that actually those sanctions don't exist.

Mr. DADDARIO. Unless the great powers are willing to comply with this compulsory aspect, you really don't have an enforcible type of international law.

Mr. BECKER. That is correct, sir.

Mr. DADDARIO. Therefore when you get right down to it, it gets down to the point of having over and above this some kind of order which can say "This you must do." I have not known of any case

where any nation has been willing, any great power has been willing to submit itself to the rest of the nations of the earth.

Therefore we are heading in an illogical direction unless we get to the point where we do have some sort of overall authority, and it should be through the United Nations or some type of overall international body.

That is all.

The CHAIRMAN. Mr. King.

Mr. KING. I would like to say first of all, I agree with Mr. Fulton that I would like to see as much action as possible. I do become a little restless when I see that the Russians are becoming what appears to be the pace setters in this whole matter. I think we should be the pace setters in all aspects of this space program.

I agree that the time is not ripe now for a codification of all the laws on outer space, but I certainly hope we can move forward and begin to block out a few of the fundamental principles that can guide us in moving forward in this area.

On the matter of cooperation——

Mr. WILCOX. May I interrupt there, Mr. King, just long enough to say that I do think that in this field of international cooperation, the United States is something of a pace setter because here we are taking the lead in the United Nations to encourage that body to move forward.

It is the Russians who are dragging their feet up to this point and refusing to cooperate with the United Nations' effort.

Mr. KING. I appreciate your making that comment. That is very heartening, and I think we should continue every effort in the direction of cooperation. That leads me to the question that I was going to ask.

Assuming we get no cooperation from Russia—I hope we will, but looking at it realistically, I must be frank to say I don't see any cooperation within the immediate future. Upon reading the interview that Khrushchev had with Eric Johnston and others, he talks incessantly about the fact that their all-consuming desire is to leave us in their dust, and they have the thing all blocked out and they know how they are going to do it and they are going to humble us. I just don't see any cooperation in their attitude at all.

But now my question is: Assuming we get no cooperation from them, can we still make substantial progress with the materials that we have to work with in the direction of setting up international rules that can be acceptable and will the cooperation that we do get from friendly nations be sufficiently substantial so that we can still go ahead and get much of the benefits of a cooperative program?

Mr. WILCOX. So far as the cooperative program is concerned, I think we can make a good deal of progress, because as I pointed out earlier, the work of this particular committee is primarily to prepare an inventory which can be prepared to a very large extent with the materials and the information which is now available from other sources.

At an appropriate time, I assume the Soviet Union would be invited to participate in that work in submitting information that might be useful to the committee.

But so far as the rules of law are concerned, I will refer that to Mr. Becker.

Mr. BECKER. I think there, too, Mr. King, if we and the great majority of the nations agree on particular rules with respect to liability or satellites or things of that sort, the Russians can continue, strictly speaking; and take the attitude that everybody is out of step except Johnny.

But I think that where you have a great majority—over two-thirds of the nations of the world—saying "This is a rule of law," you are going far to make that customary international law. It is built up sometimes that way. Just by their intransigence, they cannot hold up the development of law in this field.

Mr. KING. So we could go ahead with a codification perhaps, even without Russia's cooperation, on the theory that eventually their position would become so untenable they would have to accept this code.

Mr. BECKER. Yes. But I think perhaps your reference to codification in that context indicates one of the reasons why I feel we would be much wiser to deal first with much narrower topics, like what are permissible orbiting objects, because maybe if you get in an area there that is so small, you will get the Russians to agree and it would be infinitely better if they did agree; whereas if you tried to work out a whole code with them, I feel fairly confident you would end up with confusion and dispute.

Mr. KING. One final question: Do you envision the growth of this law to be along the pattern of the common law which essentially was the product of judicial decisions, or do you envision it rather to be statutory?

Mr. BECKER. I would envision it as being something that isn't exactly either of those, because, strictly speaking, the U.N. doesn't have the power to legislate. So you don't have a body for making statutes as such in this field.

But I would say it would develop along consensual lines by multilateral agreement that certain things are permissible and certain things are not permissible; and you have got as many as you possibly could to agree to that and you would leave the agreement open so that anybody else could accede if they finally decided that was a good idea.

Mr. KING. That would be more analagous to the statutory pattern than it would be to the judicial interpretation pattern. That is all.

The CHAIRMAN. Mr. Roush.

Mr. ROUSH. Mr. Chairman, gentlemen, isn't it a fact that one reason Russia has been so uncooperative, and chances are will continue to be uncooperative, is due to the fact that Russia believes she is far ahead of us in the space age, in this scientific age?

Dr. WILCOX. That could be a factor in her calculation. It is not always possible to know what Russian motivations are in this area or in any other area.

Mr. ROUSH. Let me reverse this a minute. Wouldn't it assure us of Russian cooperation if we can assure Russia and the rest of the world that we are ahead in every area of the scientific age?

Mr. BECKER. I think the atomic precedent indicates that that may not be entirely sound because we offered atomic disarmament at a time when they didn't even have the bomb, and yet they wouldn't agree at that time.

So whether they think they are on top or on the bottom, they just don't seem to agree.

Mr. ROUSH. Maybe they were ahead of us, or we were ahead of them in one area and not in another, though. But if we could assure them that in all these scientific endeavors we were ahead, we were in the driver's seat, it seems to me we would be more likely to get international cooperation which would include Russia.

Dr. WILCOX. That is speculative, of course, Mr. Roush. But I am inclined to agree with your basic premise. Generally speaking, the prospects of getting Russian cooperation would perhaps be greater if we could show them that we were superior in all these endeavors.

The CHAIRMAN. Doctor, I want to ask you a few questions, if I may. It would seem to me from reading your statement and listening to the statement of Mr. Becker that you two are rather far apart in your viewpoints; aren't you?

Dr. WILCOX. I don't think so, Mr. Chairman.

The CHAIRMAN. Do you think that you see eye to eye on all of these principles?

Dr. WILCOX. Well, sir, the point of view that I attempted to put forth in my statement deals more with the United Nations program and what we propose to do in that particular area. I think Mr. Becker's concern deals more with the difficuty involved in the speedy codification of international legal norms for the regulation of conduct in outer space.

I don't think his concern—if I may speak for him at the moment—refers so much to the program of international cooperation we have designed in connection with the United Nations.

I think he is in complete agreement with that.

Mr. BECKER. Mr. Chairman, I am a little surprised by your comment because I think if you will check the transcript you will find that I said at least twice that I was fully in accord with Dr. Wilcox' program of cooperation.

The CHAIRMAN. You did say it, but then you went on to say other things that would seem to me to reflect a disagreement. I am not critical of either one of the positions that you have taken.

Mr. BECKER. I think it is an important point, and I would like to make it very clear, it is my idea that scientific cooperation in this field—which is part of the program that Dr. Wilcox has—is a way in which we will be able to work out some sound rules.

The CHAIRMAN. The cooperation is really the motive power, isn't it, under which the program internationally would be put into effect?

Mr. BECKER. That's right.

The CHAIRMAN. Without international cooperation with Russia, for instance, you don't have the motive power to implement that program.

Mr. BECKER. Not 100 percent; but you can do a great deal even without Russia.

The CHAIRMAN. Would you then wait upon the voicing of cooperation from the Communists before you went ahead with the free nations?

Mr. BECKER. Not at all, no.

The CHAIRMAN. You would proceed at once, but you would not codify any principles?

Mr. BECKER. That's right.

The CHAIRMAN. Whereas now the doctor said that he would wish to codify those things that had already been established through history and development.

Dr. WILCOX. Mr. Chairman, I think there is perhaps a misunderstanding on that point. I was talking about an inventory of the things that have been done, not the rules of law.

The CHAIRMAN. You referred to it as an inventory, that is correct. Perhaps inventory is a better word than codify. But the principle is the same there. You would tabulate and put down in writing for history and for use, too, everything that has been developed to date in the field of space.

As I understand Mr. Becker, he wouldn't go that far.

Mr. BECKER. That is not my position. I am heartily in favor of the inventory. What I am opposed to doing is trying to put that out. The inventory is only step one. After you have the inventory, then you decide what types of rules you want and what is the best way of obtaining agreement to those rules.

The CHAIRMAN. Then you go after the international cooperation.

Mr. BECKER. That's right, sir.

The CHAIRMAN. If you don't get that, then you just put those things that you have inventoried up on the shelf for mothballing.

Mr. BECKER. I think you will have cooperation with a large number of nations. It is not our position that the Soviets by refusal to cooperate shall exercise a veto in advance on our part.

Dr. WILCOX. I think it is true also, Mr. Chairman, that as this cooperation develops and expands, there will be a greater appreciation of the need for rules of conduct and a greater tendency and willingness on the part of States to work toward that end.

The CHAIRMAN. I think that is true. But I think you have got to have an aggressive attitude in reference to your program if you are going to hope for that.

Mr. ANFUSO. Will the gentleman yield?

The CHAIRMAN. I will yield.

Mr. ANFUSO. What the chairman has just said is frankly along the lines of what I intended to inquire about, Mr. Becker. You prefaced your remarks, as a matter of fact—you said so right in the very beginning—that you had been misunderstood so many times and you probably were misunderstood here this morning.

I am sure we would like to give you the opportunity to clarify the record.

For example, you did mention a code of law, that we ought to wait for certain things to happen and then establish a code of law. Your thinking is that that was the way the common law was developed.

But then you clarified it, and I seemed to understand your position—for instance, you spoke, in answer to Mr. King's question, about customary international law which could be established.

So, as I take it, you are not in favor of immediately establishing a code of law. Napoleon took a long time to establish a code, for example. You are willing to move slowly by cooperation and getting as many agreements as possible, identifying them into international agreements which would be law, which could be taken to the International Court, and so forth.

Do you want to elaborate on that?

Mr. BECKER. Thank you very much, Mr. Anfuso, because that is exactly what I had in mind. As Mr. King indicated when I was talking with him, it is analagous to a statute. All I am saying is, let's not try to work out all of the rules at once. Let's say, "Here is a practical problem," and we do have a practical problem as to what are the rules that should govern orbiting objects.

Let us say on that, "What are the problems? What do we want to be the rules governing them?"—regardless of whether they are in outer space or in the airspace.

Then let's try to get people to agree that that is a sensible, limited set of rules. I think you make real progress along that line. That I am heartily in favor of.

As I already indicated, we are taking initiatives within the Government. We have problems because you have a sense of responsibility when you develop rules like that, and you have to think not only what advantage they give to the United States but—assuming this is the accepted rule—is this consistent with the best interests of the United States?

Let me tell you that a Soviet undertaking is not a coin of great value as far as I am concerned unless you have a meaningful agreement and one that they will obey. That is our problem. You have got to have an agreement, let us say, of advance notice or inspection or something of the sort.

You have to have an agreement that is enforcible because they are perfectly free to undertake anything they want and then the next week to say—as they have said with respect to Berlin—"The solemn understandings we undertook are no longer valid. We are just going to forget them."

The CHAIRMAN. I was going to ask you about that now. We have held out the suggestion to the Soviets—you said the President had done that—that they come in and offer cooperation.

What word have we received from the Soviets in that respect?

Mr. BECKER. We have had no response. The only proposal they made in this field was what to my mind and to everybody in the Department, I believe, was a rather obvious gimmick. They said, "Fine, let outer space be peaceful; but let everybody demolish their oversea bases," as an integral part of that proposal.

The CHAIRMAN. Do they refer there to the use of the oversea bases for outer space?

Mr. BECKER. No, they meant any oversea bases should be abolished as a part of their agreement.

The CHAIRMAN. In other words, they just threw that as a monkey wrench into the machinery to give us trouble in reference to obtaining egress and ingress to Berlin. We have got an agreement there. They propose to get out of the agreement by changing their status as an occupying power and put in a puppet. Isn't that it?

Dr. WILCOX. That's right.

The CHAIRMAN. Therefore that would release them from their agreement. We have no agreement to get into Berlin, we will say, by using any space means, for instance, if we were that far developed.

Mr. BECKER. A unilateral renunciation of their position would not change our position whatsoever.

The CHAIRMAN. But even if we had an agreement in reference to outer space, which might permit the use of outer space for a space vehicle entering into the Berlin controversy there, it would be abrogated by the action of the Soviets.

Mr. BECKER. That's right. The line along which you proceed when you have somebody of that type with whom you are dealing is to try to make an agreement in such form that you might say it is almost self-enforcing, that you either have somebody that has the power to inspect or has the power to prohibit and put some teeth into it.

You can do that by a single agreement much better than you can get agreement to submit everything to the World Court.

The CHAIRMAN. You have to make it so obvious that the other nation will want to comply, which sometimes is a big order for you to undertake. I believe it is with the Soviets.

Mr. BECKER. You are absolutely correct.

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. I have enjoyed the 35 minutes of Democrat questioning.

The CHAIRMAN. The record might show that the gentleman is the only one here from the Republican side at this time.

Mr. FULTON. I appreciate your comment. There have been two things come up here that you spoke of in saying let's take a practical approach.

Your later comments—I say this to my good friend, the counsel or the adviser to the State Department, Mr. Becker—find me in deep and complete disagreement with you legally. I think it is an unbridgable chasm.

Here is what I get into when I take your practical approach of just wait and see what happens, and then we will make up a rule of law as we go.

For example, I would like a ruling from you right now on a very practical problem that came up yesterday in this committee. On the sovereignty of countries above space, is there any overlapping of the U.S. sovereignty with the sovereignty of any other country in space? Can you answer that yes or no?

Mr. BECKER. That is a technical question and not a legal question. I am informed that there is not. But it is complete hearsay as far as I know.

Mr. FULTON. You are a legal adviser and I want an answer to it.

Mr. BECKER. It is not a legal question and I have no obligation to give you a legal answer.

Mr. FULTON. Where does the sovereignty go to when it goes into space? I believe you should come up with an answer to it right away because I have the next question.

Mr. BECKER. Let me comment on that, Mr. Fulton.

Mr. FULTON. Let me ask my two questions, and you can answer them both. The 14th Street Boys' Club in my district writes me and says, "We want to put a rocket into space."

You now say, well, let them fire their rocket and see what happens. This brings up this question. First, is a private citizen allowed to go into space? Second, is private industry allowed into space?

Thirdly, can the G.E. Corp. put a rocket up for communications? Fourthly, can an international corporation like the I.T. & T. put a

rocket up? Fifthly, can a corporation that is a utility, incorporated either under the laws of the United States or a U.S. agency, put a rocket up? Is there any law against it?

Am I violating the law or should I tell the young kids from the 14th Street Boys' Club, "Go ahead and shoot it up"? Here is what you get into.

From what you say, that the local laws apply, I must then say to them, "Well, there are 49 States and the Territories, plus every one of your local subdivisions, and heaven only knows who runs the law of space as far as what you are going to do, because as long as it isn't dangerous to anybody and as long as you aren't going to make a practice of it or sell space rides, it might be permissible, but possibly if you put it up you are going to be violating some sort of a law."

Will you please answer me, how shall I tell the 14th Street Boy's Club, as their Congressman, "Are we allowed to put it up or are we going to break a law?" The boys want to know. Tell me yes or no. Are they breaking a law?

Mr. BECKER. The most practical answer to you is to tell them to hire a lawyer.

Mr. FULTON. I think you are the State Department adviser.

Mr. BECKER. I don't give advice to private citizens. I give advice to the Secretary of State.

Mr. FULTON. Yes; but the question is on this, Mr. Becker: Who does have the law of that outer area that these fellows might be getting into because it may be either State, city, county law, or it might be national law.

If you will disavow for the State Department any participation in the law, then you don't answer. But, otherwise, you have to answer.

Mr. BECKER. I am interested in the law insofar as nations are involved. Undoubtedly there are some types of municipal ordnances or local or State laws—I am really unable to keep in my mind the laws of the 48 States.

Mr. FULTON. Forty-nine.

Mr. BECKER. Forty-nine; you are correct. They have certain rules as to the use of explosives without certain precautions.

Mr. FULTON. That isn't the point.

Mr. BECKER. Before they get into space they have to go through airspace, and there are plenty of rules that are applicable to the airspace that I fear might frustrate their venture at the very beginning.

Mr. FULTON. I think that is begging the question, because I am assuming there is nothing illegal locally. But I want to know who is managing the law of space above their community, that if they go into it, are they trespassers?

Mr. BECKER. There is no existing agreement that would make them trespassers.

Mr. FULTON. Then you say that private industry can shoot one of these missiles or rockets? I would doubt that.

Mr. BECKER. Let us distinguish between a missile and an absolutely innocent orbiting object.

Mr. FULTON. Let's take an innocent orbiting object. G.E. of Philadelphia says they want to put up, within a year, a communications satellite with telegraphic capabilities that will put 2,000 items a second on 4 radio channels. Can they do it, or is that illegal?

Mr. BECKER. Mr. Fulton, what you are posing now are matters that are within the full legislative competence of the Congress. If you desire to prohibit a private organization from putting up an orbiting object, that is within your power. It is not an international problem. You have absolute and complete power in that respect. If you desire to enact a law to that effect, it is within your power.

Mr. FULTON. You won't tell us where our jurisdiction ends. You will not tell me the height in space where sovereignty ends in the United States, so I can't tell what kind of a bill to put in. Then I tell the 14th Street Boy's Club, "The State Department doesn't even know how high this country is. I can't tell you what to do."

Mr. BECKER. You are in a very strategic position. You are on the surface of the earth, where they are, too. If you exercise your control at that point, they will never get into an area where you have any question.

Mr. FULTON. Suppose they put them in a boat on a lake or out in the ocean? Can they shoot it there without any local control?

Mr. BECKER. Citizens of the United States are subject to its laws, whether they are on the high seas or in the United States. If you commit an offense, the Admiralty jurisdiction of the United States would apply and they would be just as liable in that event.

Mr. FULTON. Here is what I am getting at. You see, what you do is, if you leave it to every existing agency in Government, you get a multiplicity of governmental forms operating on space.

The point of my question is: Is it not much better to have one Federal law for space that we all know simply, than what you are saying, "Let us just have it a projection of everything from the land."

Ye gods, you will get Indian reservations in space—you will have everything.

Mr. BECKER. Mr. Fulton, I did not intend to express myself at all with respect to the desirability or advisability of legislation.

The CHAIRMAN. I will say, if the witness will suspend, I don't believe we are getting anywhere on this. Here is a man coming from the State Department as an expert on international law, and we just are going back and forth.

Mr. FULTON. May I say this to you, Mr. Chairman, that I have not been told where international law takes over in space, nor will the witness tell me where his jurisdiction begins in international law and where local law ends.

Maybe that is a very consuming question and maybe it is a question that their minds should be pushed to.

The CHAIRMAN. If the witness wishes to state the extent of his authority representing the State Department, that is fine for the record.

Mr. BECKER. My field of activity relates to international law, the law of nations. There has been no determination or position on the part of the United States as to how high in the airspace or beyond the airspace the sovereignty of the United States extends. We have not as yet found it necessary to make that determination.

The CHAIRMAN. Thank you very much.

Mr. ANFUSO. Mr. Chairman, just one more question before we adjourn.

The CHAIRMAN. Mr. Anfuso.

Mr. ANFUSO. Again, Mr. Becker, for the purpose of clarifying the record and for us to fully understand your position, you are not opposed to any international agreement as to what different organi-

zations can do internationally, like General Electric or some other international organization, with respect to how high sovereignty goes, and so forth?

You are not opposed to all that, are you?

Mr. BECKER. Well, I don't think you need to get into the international agreement field with respect to activities, say, of our corporations or individuals. I am opposed, as of this moment, to any attempt to have an international agreement that says that our sovereignty extends so far up and no farther, because I say we don't have enough facts to know whether that is in the national interest of the United States.

Mr. ANFUSO. And you place that on the national interest level?

Mr. BECKER. That's right.

The CHAIRMAN. Doctor, did you want to say something?

Dr. WILCOX. Mr. Chairman, on another question, if you have finished with that one, I would like to say to you——

The CHAIRMAN. We want to close up the hearing.

Dr. WILCOX. Yes, sir. I would like to say to the chairman that I know I speak for Mr. Herter when I say that the Department would be pleased to have the privilege of consulting with the committee to have the advantage of its advice and counsel with respect to this program as we move along with it and as it reaches a more formative stage.

The CHAIRMAN. I want to say on behalf of the committee we are pleased to work with the Department of State on this very critical matter; and I think that the two witnesses who have appeared this morning have taken a very conservative and a well-expressed position.

While I refer to perhaps a little bit of differences in their opinions, still I think both of them are very strong and enforcible opinions, and I am glad to have them myself.

Mr. MILLER. Mr. Chairman, may I join you in your expressions to the two witnesses here.

Mr. FULTON. May I join with the chairman in welcoming the two witnesses, and say that we are glad to have had them. We have learned a lot and I hope the exchange was fruitful.

The CHAIRMAN. If there is no further business, this committee is adjourned.

(Thereupon, at 12:40 p.m., the committee recessed.)

WEDNESDAY, MARCH 11, 1959

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C.

The committee met at 10 a.m., in the caucus room, Old House Office Building, Hon. Overton Brooks (chairman) presiding.

Present: Representatives Brooks, Fulton, Miller, McDonough, Teague, Chenoweth, Anfuso, Osmers, Sisk, Van Pelt, Baumhart, Quigley, Bass, Riehlman, Wolf, Karth, Hechler, Moeller, King, Daddario, and Roush.

The CHAIRMAN. Coming to Mr. John A. Johnson, General Counsel for NASA. Mr. Johnson, will you have a seat, sir. Do you have a prepared statement?

STATEMENT OF JOHN A. JOHNSON, GENERAL COUNSEL, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Mr. JOHNSON. Yes, sir; I do.

The CHAIRMAN. We were sorry we couldn't hear you the other day, but this does give you an opportunity.

Mr. JOHNSON. Thank you, Mr. Chairman. I appreciate being able to appear before you.

The policy of the United States on the uses of outer space has been authoritatively stated in these words:

> The Congress hereby declares that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind.

This is a quotation from section 102 of the National Aeronautics and Space Act of 1958. It was the culmination of a series of statements by both the President and the Congress, starting well before the first manmade satellites were placed in orbit about the earth.

In his annual state of the Union message to Congress on January 10, 1957, after renewing his plea for arms reduction and safeguards against surprise attack, President Eisenhower proposed for the first time to "mutually control the outer space missile and satellite development."

This suggestion was included in the formal disarmament proposals submitted by the U.S. delegate to the United Nations General Assembly Political Committee on January 14, 1957. As there submitted, it read:

> The United States proposes that the first step toward the objective of assuring that future developments in outer space would be devoted exclusively to peaceful and scientific purposes would be to bring the testing of such objects [satellites, intercontinental missiles, et cetera] under international inspection and control.

In December 1957, following the launching of the Soviet sputniks, the United Nations General Assembly, with the Soviet bloc dissenting, passed a resolution which provided, among other matters, for a "joint study of an inspection system designed to insure that the sending of objects through outer space would be exclusively for peaceful and scientific purposes."

This was followed on January 13, 1958, by a letter from the President to Bulganin proposing, as part of a five-point program relating to control of armaments and armed forces, that "we agree that outer space be used only for peaceful purposes."

Then on April 2, 1958, the President submitted to Congress a special message recommending establishment of a new civilian agency which would be responsible for directing space activities sponsored by the United States, except for those projects primarily associated with military requirements. He stated his reasons in the following words:

> I have reached this conclusion because space exploration holds promise of adding importantly to our knowledge of the earth, the solar system, and the universe, and because it is of great importance to have the fullest cooperation of the scientific community at home and abroad in moving forward in the fields of space science and technology. Moreover, a civilian setting for the administration of space functions will emphasize the concern of our Nation that outer space be devoted to peaceful and scientific purposes.

Thus, the creation of the new civilian agency, the National Aeronautics and Space Administration, was a concrete manifestation of the

decision of this Government that activities in space should be devoted to peaceful purposes.

Henceforth it was to be understood that national policy favored the fullest and freest development of the kinds of space activities which, by the terms of the National Aeronautics and Space Act of 1958, became the responsibility of, and were to be directed by, NASA. At the same time, it was made clear that the efforts of the United States would be directed toward finding an effective means of restricting, and eventually eliminating, the use of outer space for military purposes.

The position of the Congress on this latter point had been expressed prior to enactment of the National Aeronautics and Space Act of 1958 by adoption of a concurrent resolution (H. Con. Res, 332, 85th Cong.) introduced by the majority leader of the House and member of this committee, Mr. McCormack.

The CHAIRMAN. That should be the select committee. But that does not make any difference. Go ahead.

Mr. JOHNSON. He is presently a member of this committee, Mr. Chairman.

It affirmed—

> the devout wish of all peoples everywhere, in every nation, in every environment, that the exploration of outer space shall be by peaceful means and shall be dedicated to peaceful purposes;

and it stated that it was the sense of the Congress—

> that the United States should strive, through the United Nations or such other means as may be most appropriate, for an international agreement banning the use of outer space for military purposes

Enactment of the National Aeronautics and Space Act of 1958 was followed in September of last year by the United States proposal to the United Nations General Assembly for a four-point plan pledging that outer space will be used only for the benefit of mankind.

Finally, the 13th General Assembly resolution on the peaceful use of outer space was adopted on December 13, 1958, with its opening statement recognizing the "common interest of mankind in outer space" and proclaiming that "it is the common aim that it should be used for peaceful purposes only." This resolution, sponsored by 20 powers, including the United States, established an ad hoc committee on the peaceful uses of outer space.

I have briefly reviewed this history of the past 2 years because I think it so clearly shows that establishment of the National Aeronautics and Space Administration, a civilian agency, was the expression of national policy having the most profound international implications.

The space activities which are NASA's responsibility under the terms of the 1958 act are those activities which are directed toward the expansion of human knowledge and the achievement of lasting benefits for all mankind. These are the "peaceful purposes of which the President, the Congress, and the United Nations General Assembly have so hopefully spoken, while repeatedly deploring and condemning the prospect of military uses of outer space.

The National Aeronautics and Space Administration is deeply interested in the efforts of the United States and of the United Nations to explore means of fostering the development of programs of inter-

national cooperation in the peaceful uses of outer space and of confining the use of outer space to peaceful purposes only. The resolution of the 13th General Assembly of the United Nations is a hopeful step along that road.

It is, of course, too early to predict with confidence the outcome of the United Nations study of this problem. This committee has recently heard testimony on the subject from the Assistant Secretary of State for International Organization Affairs; and it would serve no useful purpose to speculate further on the prospects of Soviet participation and the chances of ultimate success.

At the present time, the United Nations committee is the only means available of moving ahead. While the scope of the United Nations resolution is modest, a fruitful beginning may lead to ever-expanding areas of agreement. As the committee knows, the Deputy Administrator of NASA, Dr. Hugh L. Dryden, will assist Ambassador Lodge in representing the United States on the ad hoc committee. The first meeting of the committee is still several weeks off.

I have said nothing so far about space law. I would prefer, incidentally, to call it the law of space activities, because the other term seems to imply law that operates only in outer space, while I think that the most urgent need is for agreements and rules that apply and can be enforced on the surface of the earth.

This committee has heard extensive testimony on the subject recently from Mr. Becker, the legal adviser of the Department of State, with whom I am in basic agreement. I share fully his view that there is no immediate urgency about defining the upper boundary of airspace or reaching international agreement on the upward, or outward, extent of territorial sovereignty in space.

The fact that the recommendations of eminent legal scholars on this subject have been revised several times during the past few years as the variety and scope of man's activity in space has increased indicates the impracticality and, I might suggest, the imprudence of any comprehensive effort to settle this question with finality at the present time.

In this connection, it should be observed that it is relatively unimportant, so far as practical consequences go, whether a man-launched object in outer space is above the territory of the affected state when offending action is taken by it or protective action is taken by the affected state. Neither observation from a satellite, nor the descent of an object from a satellite or other space vehicle, bears any necessary relationship to the vertical projection into space of the territorial boundaries of the affected state on earth.

While one must prophesy with caution, I suggest that in practice, though not by explicit agreement, the zone of space in which the free orbiting of instruments and vehicles about the earth can occur, will be treated as beyond the territorial sovereignty of the subjacent nations. The mere passage through this space of such instruments and vehicles will, therefore, not be subject to the prior consent of any state.

Thus it will differ from the airspace which is subject to the rule of territorial sovereignty expressed in the Chicago Convention on Civil Aviation. But where the precise boundary between the two zones will be, I cannot say, nor do I think it likely that a serious effort will be made to reach agreement on it for some time to come.

I do not recommend that any such effort be made at the present time, because I think it would have little, if any, practical effect, and the effort would divert attention from more significant work at hand.

As our experience in space increases, and as our activities multiply, I am convinced that the present preoccupation with this question of sovereignty in outer space will give away to a more fruitful emphasis on the nature and purpose of the specific activity in space, how it affects the security interests of individual nations and the international community as a whole, and the relative importance of other interests, such as scientific and commercial, to be served by the activity.

I am hopeful that the emphasis will shift from the more abstract legal questions, such as the extent of territorial sovereignty, to some very practical problems of international organization, cooperation, and control.

The United Nations resolution on the peaceful uses of outer space looks in this direction. Among other things, it calls upon the ad hoc committee to report to the General Assembly at its next session on "the nature of legal problems which may arise in the carrying out of programs to explore outer space."

The National Aeronautics and Space Administration regards the entire subject of what I choose to call the law of space activities as a matter of the utmost importance. Our interest is evidenced by the fact that NASA is providing the financial support for a research project by the American Bar Foundation covering this entire subject which will be carried on for the remainder of this year.

Under present circumstances, a comprehensive convention for control of outer space activities appears most unlikely. However, I think we can begin to move ahead in certain areas where agreement seems clearly in the interests of all nations and where self-enforcing arrangements appear possible. The starting points might well be an agreement to coordinate satellite launching schedules, and an agreement making freely available to all nations certain types of information obtained from space activities.

At some time, if we are to confine the use of space to peaceful purposes, we must move to a system of international inspection, perhaps under United Nations auspices, of space vehicles prior to launching for the purpose of assuring all nations that they are not equipped to inflict injury or damage.

I think we must recognize that unless collective steps are taken to subject the exploitation of outer space to an orderly restraint, it is quite probable that fear, rather than hope, will dominate man's attitude toward these amazing new developments, and that national security, rather than scientific advancement and the economic benefit of mankind, will keynote every new effort. It is the task of law and international organization to prevent such a disaster.

The CHAIRMAN. Thank you very much, Mr. Johnson, for a very lucid and able statement on this subject. I want to ask you, if I may, this question: All through your statement you refer to outer space as being under international control and differentiate that from the control of air space.

Where is outer space to begin?

Mr. JOHNSON. Mr. Chairman, this is the problem which I said, at one point in the statement, I didn't think we would be able to arrive at a clearcut decision on for some time to come.

The CHAIRMAN. Give us a vague opinion.

Mr. JOHNSON. But I did prophesy that the limit of territorial sovereignty would be somewhere below the altitude at which the free orbiting space vehicles can take place. To be more specific—I am not, of course, a technical man, and can't speak with finality on this—but there have been a number of estimates made and one of them is that it is possible for the free orbiting of vehicles to continue without any appreciable interference from the very rarified atmosphere that may exist at altitudes of 120 miles and farther out above the earth.

On the other hand, it seems unlikely that it will be possible to devise aircraft that will rely primarily upon aerodynamic lift at altitudes above 50 miles. It is my opinion, since the law is already settled that airspace is within the territorial sovereignty of the subjacent State, that when the time comes for agreement, this line will be drawn somewhere between 50 miles and 120 miles. I am speculating now, and I think at the moment it is not useful to be more specific.

The CHAIRMAN. You also refer to the peaceful use of outer space, and that outer space should, we hope, be nonmilitary.

How would you harmonize that with the angle of a ballistic missile, an intercontinental ballistic missile, that has an arc which might run up 800 miles?

Mr. JOHNSON. Mr. Chairman, it is not necessary, of course, that we adopt a rule by international agreement extending territorial sovereignty out beyond that point that I mentioned in order to preclude the use of outer space—that portion of space which then by agreement would be beyond territorial sovereignty—from being used for military purposes.

Let me just refer to the situation over the high seas. The fact that none of the airspace over the high seas is subject to the territorial sovereignty of any nation would not prevent nations from entering into an agreement preventing the use of the high seas or the space above the high seas for military purposes.

It would mean this, that if it were agreed that such an area was not within the territorial sovereignty of the underlying state, then no individual state, on its own, could preclude the use of that space for an activity by another state.

On the other hand, if any such use appeared to be detrimental to the interests of the underlying state, if it appeared to fall in the area of an armed attack, or an incipient armed attack, then the right of self-defense of any nation, under international law or the United Nations Charter, can be invoked just as it can be invoked at the present time for activities taking place over the high seas.

The CHAIRMAN. Any questions?

Mr. DADDARIO. I have a question, Mr. Chairman.

The CHAIRMAN. Mr. Daddario.

Mr. DADDARIO. Mr. Johnson, as the General Counsel of NASA, would you recommend that in addition to Dr. Dryden and Ambassador Lodge, that the United Nations ad hoc committee include a Member of Congress, a member of this committee and a member of the Senate committee in this field?

Mr. JOHNSON. Mr. Congressman, I think this is a question on which I shouldn't express an opinion. The reason I say that is that I have had nothing to do, from the standpoint of policymaking in the executive branch, with the makeup of this committee.

I think the question is quite outside my competence as General Counsel of NASA.

Mr. DADDARIO. I asked that because you are General Counsel and because you lay such stress on the importance of this committee and the possibilities which it may be able to develop. It seems to me, that being the case, and because this committee does represent the thinking of Congress in this area, that perhaps some thought might be given to such representation.

Mr. JOHNSON. I agree, Mr. Congressman, that it is a proposal worthy of very serious consideration.

Mr. DADDARIO. I just wanted to call your attention to that.

The CHAIRMAN. Any further questions? If not, we certainly thank you, sir, and appreciate your statement, which I am going to read over again and study.

If there is no further business, we will adjourn until tomorrow morning at 10 o'clock.

(Whereupon, at 11:50 a.m. the committee adjourned, to reconvene at 10 a.m., Thursday, Mar. 12, 1959.)

(The following was submitted for the record:)

STATEMENT OF ADMIRAL WARD

THE JUDGE ADVOCATE GENERAL OF THE NAVY,
Washington, April 23, 1959.

Hon. OVERTON BROOKS,
Chairman, Committee on Science and Astronautics,
House of Representatives, Washington, D.C.

DEAR MR. BROOKS: At your request, communicated to me through your staff member, Mr. Philip B. Yeager, I am submitting herewith a statement of my analysis and recommendations concerning national security interests and the development of space law.

I am deeply appreciative of the opportunity and honor thus accorded me. May I express my thanks to you and convey my best personal regards.

Sincerely yours,

CHESTER WARD, *Rear Admiral, U.S. Navy.*

THE NATIONAL SECURITY INTEREST OF THE UNITED STATES IN FREEDOM OF SPACE

Statement submitted to the Committee on Science and Astronautics of the House of Representatives by Rear Adm. Chester Ward, U.S. Navy,[1] the Judge Advocate General of the Navy

A premature, overoptimistic, unsafeguarded plunge into space law through international agreements restricting the freedom of space will seriously threaten the survival of the United States.

Too many people—particularly lawyers—are seizing upon space law as an escape solution from the unbearable tensions created by the unrelenting Communist drive to communize the world. Too many see it only as a virgin field for appeasement on a cosmic scale, for "accommodations" with the Communists which can carry us out of this war-weary world, for "disengagement" from the unpleasant obligations of national self-preservation.

These criticisms of the optimistic approach to space law are controversial statements; and there are more to come. Certainly they will be unpopular—

[1] Member, Committee on the Law of Outer Space of the Section of International and Comparative Law of the American Bar Association; member, Permanent Legal Committee of the International Astronautical Federation.

especially with those so zealous in their demands for an end to the "cold war" that they are willing to ignore the massive evidence of intentions and methods piled up by 40 years of Communist conquest and conspiracy. But such statements will be unpopular also with many brilliant and well-balanced lawyers and statesmen who cannot be discounted as zealots. To put the burden of all this unpopularity where it belongs, I assume, in the first person, the responsibility for making these statements, and assume also the responsibility for supporting them. I have no right to permit any of such responsibility to fall on the Department of the Navy, the Department of Defense, or the U.S. Government. I speak for myself alone.

Indeed, I am very much alone in my appraisal of the magnitude of and multiplicity of the threats to survival implicit in premature commitments in space law. I seek recognition of the fact that the defense of the United States could be hindered by some types of early developments in space law—primarily those of a restrictive nature.

I am especially concerned with the theory that it is possible to develop a space code aimed initially at the creation of legal principles to cover scientific and commercial matters—and thus bypass, for the present, the larger policy decisions bound up in security and defense.

This "bypass" reasoning reflects the peculiar penchant of writers on the law of space to make assumptions contrary to the facts of life on earth. They tacitly assume that "the missile problem" can be "disengaged" from possible agreements on the use of outer space, so that such agreements will "not get bogged down in disarmament negotiations." Senator Kenneth B. Keating is much more explicit. In addition to asserting that civil and military uses of space "can" and "must" be distinguished, he states that, "from the practical standpoint of developing a space code, the military view is immaterial"; and further, "there is every reason to proceed with whatever agreements can be reached relative to the use of space without worrying overmuch about whether we shall hamstring the military." "Reaching for the Stars: Space Law and the New Fourth Dimension," 45 ABA Journal 54 (1959).

I submit that a space code restricting the freedom of space would indeed hamstring our military; and that project Argus proved it.

DISARMAMENT CANNOT BE DISENGAGED

The issue of survival cannot be suppressed; nor can the disarmament problem be disengaged. The reasoning that this can be done is, I respectfully submit, largely irrelevant, and certainly it seems to beg the realistic issue. Neither the physical facts nor the functions of space vehicles can be forced into the fanciful framework wrought by the escapist, would-be architects of "peace through law" in space. For certainly it is an escape solution to assert that missile problems, plus all disarmament problems and security and defense issues, should be—and therefore by tacit assumption can be—severed from the remainder of the essential agenda of any practicable system of space law.

Certainly there are no "legal reasons" why there could not be developed a "space code aimed initially at the creation of legal principles to cover scientific and commercial matter." But this is irrelevant, because it's not the law, but the facts of space utilization which are such as absolutely to preclude any realistic possibility of "thus bypassing" the "larger policy decisions bound up in security and defense." On any realistic basis, it is just as impracticable to attempt to "disengage" the burdensome contributions missilry has made to the problems of space control, as to disengage the beneficial contributions military efforts have made to man's success in penetrating space at all.

Consider first the vehicles themselves. All types of space vehicles have potential capabilities of military value, and these capabilities cannot be physically or functionally severed from a type of space vehicle honestly intended for civilian or purely scientific use.

Turning from the space vehicles themselves to their uses or functions: the stubborn, unpleasant, inescapable fact is that scientific and commercial uses of space are so inextricably intermixed with security and defense interests that they simply cannot be severed therefrom. Furthermore, there is grave danger that our future essential defense capabilities may suffer from any insufficiently safeguarded attempt even to define the terms "scientific" and "commercial" uses in this critical connection.

Substantially every scientific use of space has military implications: many are known to us even now; probably many more exist but are not yet discovered or capable of being understood at this infantile stage of space developments. This should be proved beyond cavil by the SCORE project: the mission of the Atlas missile of December 1958 was "Signal Communications by Orbiting Equipment." It established that men in space vehicles will be able to talk to men on earth.

Scientific accomplishments? Definitely; but equally a military accomplishment in space, and one which foreshadows much more reliable military communications on this earth. Yet this unprecented achievement is already declared to be "as primitive as baby's first words." So much for the nonseverability of the triple potentials of the communication satellite, because commercial possibilities are just as inevitable.[2]

Of equally vast military significance will be any scientific-use reconnaissance satellite, under whatever name: but the scientific, commercial and military potentials are—as a matter of fact, not of law—nondisentangleable. So also as to various other types of weather and so-called scientific satellites. For those reasons it is impossible to draft international agreements which would effectively deal with scientific and commercial uses of space vehicles without automatic involvement in the military potentials thereof, and consequently running head on into the disarmament problems which were sought to be bypassed or disengaged.

The search for world peace through space law therefore should seek other alternatives. What are the possibilities of agreements restricting the use of outer space to peaceful purposes?

The United States is, of course, already leading in official declarations in favor of peaceful uses of outer space. Congress has endorsed this objective both in resolutions and in substantive law (the National Aeronautics and Space Act of 1958). Even in our United Nations resolution of December 12, 1958, however, we speak in terms of "international cooperation and programs." This is quite a different thing from a proposal for international agreements purporting to control the use of outer space. Cooperation can do no harm, and may do much good. International control agreements, on the other hand, can—at the present time—do us little good, and, for several reasons, could do us substantial harm.

PEACE—A SEMANTIC TRAP

The first disadvantage we suffer in any negotiations with the Communists dealing with the term "peace" or "peaceful" is that we are largely incapable of understanding what they mean by the term. One of our seven fatal fallacies is our assumption that the Communist meaning of peaceful is the same as ours. In so assuming, we are laying the basis for suicide by semantics. In any negotiation they are never sincere—in our meaning of that word. They are, however, both constant and consistent. The Communists never deviate from their basic dogma that the social and economic structure of capitalistic nations inevitably generates war, and that, consequently, peace can be achieved only by complete worldwide subjugation of capitalism and creation of a universal federation of Soviet Socialist Republics. Therefore, any action toward the conquest of capitalism is a peaceful action; similarly from this premise, any action by a capitalistic nation to preserve the staus quo, or even to thwart the worldwide march of communism to the extent necessary for its own survival, is warmongering.[3]

Our own naive idea of peace is a sort of live-and-let-live status in which men are neither killed, tortured, starved, nor imprisoned en masse for political beliefs; in which neither life, nor liberty, nor property is forfeited without due process of law. These things, to us, are essential elements of living at peace. Yet, perversely, we will apparently support or attempt to buy anything—without any of these elements—so long as it is called peace. We seem completely incapable of understanding, either intellectually or psychologically, that the Commu-

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[2] Dr. Hugh L. Dryden, Deputy Administrator of the National Aeronautics and Space Administration, viewed the SCORE Atlas as demonstrating "in dramatic fashion some of the potentialities of the commercial satellite. This first step is expected to lead to an economically sound, wide band, reliable worldwide communications system." Washington (D.C.) Star, Dec. 27, 1958.

[3] Stated much more effectively in Dr. Henry Kissinger's "Nuclear Testing and the Problem of Peace," 37 Foreign Affairs 1 at 6. I respectfully recommend it for reading by all who are interested in the survival of the United States.

nist type of peace can be infinitely more terrifying and vicious than any wars we have thus far endured.

In war the prospective victims at least have a chance to fight back; in Communist peace it is always too late for that. The Communist countries and their slave states have enjoyed peace for some dozen years continuously now, yet the Hungarian freedom fighters could not really fight back against the massed tanks and mechanized might of the Russian Army. The millions of Russia's own Kulaks could not fight back against mass starvation-to-death imposed as an instrument of Communist Party policy. The scores of millions of Chinese peasants liquidated in the vast prelude to the ultimate slavery of peoples' communes had no chance to fight back against the benevolent agrarian reformer-not-real-Communist masters. An estimated 14 million disposed of in the year 1951 alone; and more scores of millions to come, as foreshadowed by the Macao-verified machinegunning in mid-December 1958 of the pitiful resistance in the Sappa Island commune of Wanchai.

RUSSIAN LAND MASS POWER

But even assuming contrary to fact that we are not hopelessly taken in by the Communist general meaning of peaceful, too narrow a specific definition thereof in relation to international agreements governing the uses of outer space could greatly advantage the Communists and disadvantage us. This is because of the difference in the constituency of their military power and ours here on earth. Their landpower is fantastically greater than ours. Not only does their standing army of some 2,500,000 men dwarf our 870,000-man Army, but each year they add twice as many ready reserves as we do—700,000 to our 350,000 (the armies of the Communist bloc total 7,200,000). Communist controlled population is fast approaching 1,000 million, and the enslaved Chinese alone add 15 million a year. Furthermore, their Communist-controlled land-mass totals a vast 13,385,368 square miles against our 3,082,809 square miles. This provides them with incalculable advantages in dispersal of industry, population, and missile sites.

Both our deterrence of general war and our survival, therefore, depend upon our superiority in nuclear weapons, upon our ready capability for strategic and tactical delivery thereof, and upon mobile naval forces to offset their land-mass advantage by our control of the sea—forces capable of discriminating use of nuclear as well as conventional weapons to deter or win limited wars. We are more likely to be nibbled to death than incinerated in wars in a nuclear holocaust—provided always we maintain a realistic thermonuclear deterrent. But we cannot count on a deterrent if it remains static: The power relied upon must be constantly improved to keep up with the new speed of science.

Believing what we prefer to believe, we assume that general war is extremely unlikely and that "deterrence" is automatic, continuing, and inevitable because we possess thermonuclear weapons and systems to deliver them. The so-called atomic stalemate has become a source of great complacency for us. We believe what we read in the papers—and ignore such warnings as:

> "Western journalists have greatly overestimated the difficulties of a Soviet surprise attack with thermonuclear weapons and vastly underestimated the complexity of the Western problem of retaliation. * * * Deterrence is a matter of comparative risks. The balance is not automatic. First, since thermonuclear weapons give an enormous advantage to the aggressor, it takes great ingenuity and realism at any given level of nuclear technology to devise a stable equilibrium. And second, this technology itself is changing with fantastic speed. Deterrence will require an urgent and continuing effort." [4]

If we confuse deterrence with matching or exceeding the enemy's ability to strike first, we may not provide ourselves with a sufficient capability to strike second. In this case our supposed deterrent could prove to be a fatal illusion.

Just as our survival depends upon our recognizing that the Soviets may start a general war, it is equally essential, however, to realize that they have a tremendous capability to conduct limited war, not only war around the periphery of the huge Communist land mass, but also—through stooges—throughout the entire world. So we also need to maintain and develop our own countercapa-

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[4] Albert Wohlstetter, "The Delicate Balance of Terror," 37 Foreign Affairs, 211 at 213 and 222. Although his approach to the problem of national survival is different from that of Dr. Kissinger in "Nuclear Weapons and Foreign Policy," it is equally indispensable.

bilities for deterring and winning limited wars. And, for both general and limited war purposes, we must continue our development of nuclear weapons.

The primary point is that we do not have now—and have no prospect of generating or supporting—sufficient land power or conventional forces to deter or resist their similar forces in an all-out contest. Remember that the President of the United States recently summed up our situation in this unanswerable question: "What good would it do to send a few more thousands or indeed even a few divisions of troops to Europe?"

David would have had little chance with Goliath if David had not perfected his sling—or if he had been talked into throwing it away or not using it. We need to keep our nuclear supremacy if we want to deter attack and to survive. Even if we never actually employ it, it will serve its purpose if we maintain our capability and our will to use it.

In any event, it is certain that we must recognize nuclear weapons both as the only possible equalizer to the Communists' vastly greater conventional military power, and as the essential deterrent to Communists' unleashing their own nuclear warheads; warheads which, if presently inferior to ours, might enjoy riding intercontinental vehicles of apparently much greater thrust. And with which we have been so recently threatened by Pravda with total destruction if we commit the "aggression" of failing to surrender Berlin. (See how their semantics work.)

Since our national survival may constantly depend upon maintaining our superiority in nuclear weapons, we should consider well at least one specific example of how we may sacrifice—through premature or unsafeguarded international space agreements—our chance to keep the necessary margin of progress in developing better, cleaner, and more precise forms of atomic military power. This requires a look at how free we now are to make use of outer space, unfettered as yet by any international agreements.

There is a very substantial consensus that—regardless of where outer space does begin—it is "free," and not subject to claims of national sovereignty. This conclusion is reinforced by the statement of the Rapporteur of the United Nations First Committee as to the debate on Agenda Item 60, "Question of the Peaceful Use of Outer Space":

> "The debate further showed the complexity of the problem of outer space with regard to its juridical, scientific, technical, and political aspects. The idea of the international character of outer space as a res communis omnium seemed to have been generally accepted."

Also, Senator Lyndon Johnson in his recent statement before the Political Committee of the General Assembly declared that:

> "Today outer space is free. It is unscarred by conflict. No nation holds a concession there. It must remain this way."

There is one additional and very practical reason for considering outer space as "free." No one has yet devised an effective means for rendering it unfree—that is, of exercising effective dominion over it.

Thus, absent international agreement, outer space is free to be used in all manner exactly as the high seas have traditionally been used. The effect of any international agreement will thereby be to restrict this freedom. It is significant that U.S. expression generally emphasizes the idea of "peaceful use" whereas the Communist proposal of March 15, 1958, speaks of a "ban on the use of cosmic space for *military* purposes." [Italic supplied.]

Limiting the use of outer space to "peaceful purposes" certainly does not necessarily exclude harmless scientific testing of weapons. On the other hand, an international agreement banning use for "military" purposes would most likely be construed to ban the testing of weapons even though the tests were completely harmless. Also, the latter type of agreement would furnish a basis for fierce contention that any type of reconnaissance satellite, regardless of whether its primary purpose was scientific, was a "military" use.

Agreements of the latter type, therefore, might very well preclude the United States from developing types of nuclear weapons necessary to deter war and to insure our survival. It is quite clear that the climate of opinion may induce the United States at least to continue indefinitely the ban on the testing of nuclear weapons in any settings of substantial nuclear fallout. This eliminates surface and atmospheric tests, and leaves only the two alternatives of tests below the earth's surface or in outer space above the earth's atmosphere. What can be developed by subsurface tests exclusively probably will be limited. This would leave us with an urgent need to be free to test weapons in outer space,

where fallout is harmless. We could not meet this need, regardless of how urgent it might be, if we were bound by an agreement banning military uses of outer space, or even by a "peaceful use" agreement if it were so construed.

Consider just one outstanding example: The tremendous military value of the scientific information developed by Project Argus cannot safely be underestimated. Without access to any classified information, it is already clear from press reports that evaluations of the Argus tests have disclosed a need for changes in existing weapons, military radio communications systems, radar detection networks, and countermeasure against the effects of high altitude atomic blasts. We have a vital need-to-know concerning the offensive and defensive potential of high altitude and deep space nuclear explosions. Certainly there is a close relationship to national survival of the information already produced by Argus and capable of being produced in the near future by similar tests perhaps much deeper in space.

Certain it is that our freedom to obtain such vital information could be curtailed drastically—or even completely canceled out—if we had been blocked from testing by an international agreement restricting the use of space to nonmilitary uses. The lives of literally scores of millions of Americans may depend upon whether our early missile warning systems work. And the press has observed that it is clear from the statements of Defense officials that such explosions may be used to hamper these warning systems and delay our reaction to surprise attacks. The possibility of Communist evasion of a ban on such use of space is also clear. From the depth of their vast land mass they could blast test vehicles and warheads into the vastness of deep space with little fear of detection; and with results radioed back.

Thus we could be seriously disadvantaged by the terms of an international agreement limiting the freedom of space. But we face—or generally refuse to face—an even broader problem with respect to agreements with the Communists, even if specific terms do not in practical effect put us at a disadvantage. What ever the subject of an agreement—whether nuclear tests, prevention of surprise attacks, or the scheduling and control and inspection of space vehicles—by becoming a party to such agreements with the Communists, all we accomplish in the long run is to hamstring ourselves.

"AGREEMENTS" WITH COMMUNISTS BIND US ONLY

It would appear that if we do desire to survive in freedom we cannot afford unilateral self-limitation on our development of such incalculably valuable military capabilities as are potential in developing the use of outer space. Of course the dream-world optimistic answer to this is that no limitation we would enter would be unilateral. The theory is that the scientific and commercial use-limitations would be imposed by international agreement, which would bind Russia and the Communist bloc just as it would bind us.

The only way this theory works, however, is to dig the deepest of all traps for us, and to bait it with the one bait we find hypnotically irresistible: the hope of world peace and the end of international conflict. For that theory breaks on the one fatal fact which we as a nation and as individuals seems incapable of recognizing: No international agreement is capable of binding Communist Russia; nor can any such agreement be enforced against her. Who can and will supply the force for the enforcement? We have 40 years of fullsome (in the dictionary meaning thereof) evidence of that fact—but it doesn't fit in with our wishful theory—so we disregard it. The fact would be proved if, out of every 13 agreements with us, Russia could breach even 1 with impunity; but the statistics show that out of every 13 such agreements, Russia violates 12.

It wouldn't be nearly so threatening to our survival if the only danger of our entering into international agreements controlling the use of space was merely that such agreements cannot bind Russia. The real danger—and it's so real that it may be the death of our trusting, idealistic country some too soon day—is that such international agreements to which Russia and the United States are parties, do bind us even though they don't bind the Communist. When we enter into an international agreement, we keep it. Against us, it is self-enforcing. Not so for the Communists; look at their record.

The President of the United States has done so. And here is what his study of their record discloses—expressed in his state of the Union message delivered to the Congress on January 7, 1959. Although undoubtedly one of the most significant points of the President's address, and although truly

sensational so far as the long run interests of the United States are concerned, little play was given in the press to these words of our President:

"We cannot build peace through desire alone. Moreover, we have learned the bitter lesson that international agreements, historically considered by us as sacred, are regarded in Communist doctrine and in practice to be mere scraps of paper. The most recent proof of their disdain of international obligations, solemnly undertaken, is their announced intention to abandon their responsibilities respecting Berlin.

"As a consequence, we can have no confidence in any treaty to which Communists are a party except where such a treaty provides within itself for self-enforcing mechanisms. Indeed, the demonstrated disregard of the Communists of their own pledges is one of the greatest obstacles to success in substituting the rule of law for rule by force."

This always awful and possibly fatal danger which may entrap us in international agreements is forcefully explained by Dr. Henry Kissinger in his truly magnificent article, "Nuclear Testing and the Problem of Peace":[5]

"* * * evasion will be easier to attempt and to conceal in the Soviet Union than in the West. In the West a ban on nuclear testing will be largely self-policing, because public opinion will not countenance evasion and scientists will not lend themselves to it. No such inhibitions will exist in the U.S.S.R."

Although Dr. Kissinger was speaking specifically of agreements limiting nuclear testing, the analogy to agreements limiting the use of outer space is fearfully close. Substantially all the same traps can be set for us in space law negotiations—plus most of those we encounter in the field of negotiations for agreements to prevent surprise attack. This is, of course, inevitable, because the control of the use of space will logically include not only problems as to testing of nuclear weapons, but also the even tougher problem of preventing use of space vehicles in surprise attacks.

This brings us to consideration of the second major space trap into which we may fall, that of an international system for scheduling satellites, without the safeguard of an adequate and absolutely effective advance inspection system. Such system, without such inspection, could easily lull us into a sense of false security from which we would be wakened only by hydrogen holocaust.

Much is made of an asserted urgent necessity of being able to distinguish a harmless scientific satellite from an intercontinental ballistic missile, and it is assumed this can be accomplished by international agreement for scheduling and advance notice. It is assumed also that an effective inspection system could be devised. Here again we have the analogy to the problem of inspection for nuclear test bans. As to this, Dr. Kissinger has pointed out that:

> "In any event we must keep in mind that the best inspection system can guard only against presently known methods of evasion. In the nature of things it is difficult to protect against a contingency not yet imagined."[6]

This later remark is equally applicable to space vehicles. Furthermore, as scientific and other peaceful applications grow and launchings become more common, a nation determined on evasion could overload the inspetion mechanism by hiding the hydrogen warheads among many innocent vehicles.

Not only are overoptimistic space-law writers unwilling to face the fact that an effective inspection system may be impossible—some don't even want to mention the subject of inspection at all, for fear of offending the Russians.

I suggest that for the United States to enter into such an agreement without a reliable inspection plan would be tantamount to important unilateral disarmament. This is an alarming segment of our dangerous proclivity to seek agreements for the sake of agreement; of agreements for the sake of winning votes in a please-love-us international popularity contest; and, most perilous of all, agreements for the sake of "accommodation" to promote peaceful coexistence.

Symptomatic of this compulsion toward concessions is the following:

> "The breakthrough to outer space has seemed to most people to require a breakthrough to a less uneasy peace * * * this dreary slide down the slope to possible disaster must somehow be reversed. And outer space opens up a new area for *finding accommodations* which, if properly exploited, could

[5] "Nuclear Testing and the Problem of Peace," supra, note 2, at 3.
[6] Ibid.

at last reverse the trend." [Italic supplied.] S. Metzger "Symposium on Law of Outer Space," Ohio State University, Apr. 12, 1958.)

This has at least some logical appeal, in that all the accommodations made to the Communists on this earth—Potsdam, Teheran, Yalta, and in the United Nations—have failed to buy their consent to let the world live in peace. Despite the vast scope of these concessions, they were finite. Now we have an opportunity to offer appeasement extending through the infinity of space.

Nothing could be more serious, really, than the consequences of this compulsion to concession. It leads step by inevitable step to surrender. It is, indeed, surrender on the installment plan; the price of peace at any price. Ironically, it—like its twin, the compulsion to agreement—stems from a completely false assumption; and if we can eradicate this assumption, we simultaneously eradicate also the compulsion to national suicide.

THE GREATEST DANGER

I submit as my own conclusion that, in this connection the "greatest danger of all" would be to carry over into the foundations of the law of space these two false assumptions:

(1) The basis for the concession compulsion: that the United States is jointly responsible with Communist Russia for the tensions of the cold war covering the earth—the "national rivalries", the "national struggles for supremacy" [7]—which if "projected onto the larger screen of the cosmos" will result in disaster to the world.

These tensions result solely from the repeatedly declared determination of the Communists to conquer the world, to "strike down capitalism as a whole" (Lenin), to push the Western powers "to their graves" (Khrushchev), and from the protracted warfare conducted by the Communists to achieve their ultimate objective of a worldwide system of Soviet socialist republics. We are not (perhaps unfortunately) engaged in a "struggle for supremacy" with the Communists. This is proved by the fact that at the end of World War II we possessed the greatest conventional military power in all history and had a complete monopoly on the atomic bomb. This power, had we desired to seize world supremacy, was more than sufficient for the objective. This we voluntarily renounced and made concession after voluntary concession to show the Russians that we trusted them and had no intention to dominate the world. We didn't make the issue of world domination by the Communists, and we can't change the issue. The only possible way that we can reduce the tensions is by total surrender. Disengagement and "accommodations" merely breed new Communist pressures and hence additional tensions.

(2) The basis for the agreement compulsion: that peace with the Communists can be attained through law or international agreements.

Communist dogma insists that promises, like piecrust, are made to be broken. In the 40 years of its existence, the Soviet Union has entered into over 2,000 agreements, yet no agreement has ever been enforceable against the Soviet.[8] There is now no military power sufficient to enforce an agreement against the Communists. We had such power once but never used it despite their multiple breaches of the most solemn and important international agreements which would have provided a free Eastern Europe. Neither will the pressure of world opinion nor the United Nations avail to enforce the promises of the Communists. One proof of this: Hungary. The proof that Soviet intentions of breaking promises haven't changed: the Berlin ultimatum, backed up by threats of unleashed hydrogen warhead intercontinental ballistic missiles. Tibet is a fine example of how the Chinese Communists follow the Russian Communist line in the cynical violation of treaty obligations.

That agreements with the Communists lead not to peace but to conquest and enslavement is most convincingly demonstrated by the deadly history of their nonaggression pacts. These are, of course, their usual documentary promises of peaceful coexistence, but any other similar type treaty such as of alliance or mutual assistance will do if it serves the purpose of lulling the other party into

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[7] M. Cohen, McGill University, The Reporter, June 12, 1958, p. 19.

[8] Realistic recognition of the non-enforceability of international agreements against Communist Russia is sensationally evident in the President's State of the Union message as quoted on page 16. For one recent example of the numerous significant studies of the same subject conducted by the Congress, see Extended Remarks of Representative Madden (Indiana) in Congressional Record for 13 April 1959, page 5197.

a feeling of false security and creating that atmosphere of mutual trust about which our proponents of disengagement, of accommodation, and of international agreements are so enthusiastic.

Here is a partial list, stretching back to 1920, of countries with which Communist Russia had such agreements: Georgia, Ukraine, Lithuania, Estonia, Latvia, Poland, Finland.

Upon pondering the fate of these once-independent nations, lawyers who form their opinion on the evidence might well conclude: Whom the Communists would destroy, they first invite to coexist, and offer a nonaggression agreement.

"We are never deceived," said Goethe, "we deceive ourselves." Isn't it about time to free ourselves of our deception that accommodations can buy peace from the Communists and that peace with them can be secured through law—even space law?

Stripped of these delusions, space law can indeed be a useful instrument, and bring about order where disorder would be dangerous. If early space law is not distorted in an attempt to accomplish the impossible, it can indeed be effective in promoting the type of international cooperation envisaged by the United Nations resolution sponsored by the United States and 19 other nations—and significantly spurned by Russia.

We all can agree with a distinguished authority on space law who concludes that:

> "Having achieved such sophisticated means of destroying one another here on earth, we should not be daunted by fear of the unknown potentialities of space." [9]

If, however, we really want to survive in freedom to enjoy the great age of space, we should realistically appraise the known potentialities of the Communists.

Communist potential in massive unequaled landpower on this earth has been considered above—together with the undeviating purpose of global conquest for the accomplishment of which they generate all types of monetary, economic, and political power. Communist space power potential is brought alive for us—too often for our complacency—by news of Russian "firsts" or "mosts" in space.

We need to underscore the importance of the relative position of the Communist space accomplishment as compared with our own. The Atlas we blasted into orbit weighed 4.3 tons and carried 150 pounds of instruments. Sputnik II, launched more than a year earlier, put a substantially greater weight into orbit and, more significantly, the payload of Sputnik III probably exceeds that of our Atlas by more than 10 times. These comparisons, together with the Russian-first sputnik and the Russian-first lunik, are symptomatic of Communist space power.

Space power is military power, too. Indeed, the military potentialities of space technology are far greater than general public discussion to date suggests. Emphatic support of this concept appears in the final report of the House of Representatives Select Committee on Astronautics and Space Exploration, entitled "The United States and Outer Space," of January 3, 1959:

> "It cannot be overemphasized that the survival of the free world—indeed all the world—is caught up in the stakes. Outer space is fast becoming the heart and soul of advanced military science. It constitutes at once the threat and the defense of man's existence on earth.
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> "* * * A new age is dawning. If we are unprepared, we may be swept away. At best our situation is dangerous. It finds us vulnerable not only to the threat of nuclear, chemical, and biological war, with space employed as a medium of attack, but to the more subtle and equally threatening danger which lies in morale, psychological and political fields."

An imaginative and colorful statement of the politico-psychological potential of accomplishments in the conquest of cosmic space is stated in the National Review of January 17, 1959:

> "The launching of Lunik (or Mechta—'dream'—it is more officially and more revealingly named) was not primarily a military act. It was a gigantic slice, rather, of that Pie in the Sky of which the Wobblies used to sing. You are still cold and hungry, crowded and shabby, after 40 years of the Revolution? Ah, but we are on our way to the moon and the planets

[9] Quigg, "Open Skies and Open Space," 37 Foreign Affairs 95.

and the stars! Who can doubt the Revolution that, before the awe-struck eyes of the world, thrusts mankind forward into space? If Marxism can orbit the sun, then is not God indeed dead? Then can you—or you others in Asia, Africa, Latin America—doubt that 'the International Party shall be the human race'? The reasoning is flawed, but the emotion is compelling. For once, for perhaps the first time since the Revolution's earliest months, we cannot doubt the enthusiasm that breathes in the dispatches, and shows in the news photographs from Russia. For a moment at least the Dream seems to have brought the Russian people together in a cheering unity around their high-riding leaders. No doubt it was planned that way. * * * We could use more boldness, more flare, on our journey into space. If the mass audience must have showmanship with its missiles, should the homeland of Barnum, Belasco and Cecil B. DeMille back away from the competition?"

It is exactly because of the incredibly momentous importance of space activities to the survival of the United States that I submit that it would be premature and dangerous to commit ourselves at this time to a code of laws which would control our activities in space. We simply do not and cannot know enough about the facts of space to conjure up a code of laws to control it. We haven't yet the basis for even the most inchoate conception of what will be the ultimate and survival interests of the United States in space activities. The Communists have enough advantages over us in their early start in the conquest of space so that we surely cannot afford to add to their advantage by imposing artificial, uninformed legal—and, in ultimate effect, unilateral—restrictions upon ourselves.

In other words, what concerns me most about the space age is that we and our children and our children's children shall survive in freedom to enjoy this great new era. And survival may depend upon preserving the freedom of peace

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MAY 1 3 1959

MAIN
READING ROOM

[No. 2]

FULL COMMITTEE CONSIDERATION OF H.R. 4990 AND S. 1096 WITH RESPECT TO AUTHORIZING APPROPRIATIONS TO THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., Monday, March 9, 1959.

The committee met at 10:05 a.m., in the caucus room, Old House Office Building, Hon. Overton Brooks, chairman, presiding.

The CHAIRMAN. The committee will please come to order. This morning, gentlemen of the committee, we have H.R. 4990, a bill which I introduced at the request of the Department to authorize appropriations to the National Aeronautics and Space Administration for salaries and expenses, research and development, construction and equipment, and for other purposes.

(The bill referred to is as follows:)

[H.R. 4990, 86th Cong., 1st sess.]

A BILL To authorize appropriations to the National Aeronautics and Space Administration for salaries and expenses, research and development, construction and equipment, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That (a) there is hereby authorized to be appropriated to the National Aeronautics and Space Administration for the fiscal year 1959 the sum of $48,354,000, as follows:

(1) For an additional amount for "Salaries and expenses", $3,354,000.

(2) For an additional amount for "Research and development", $20,750,000.

(3) For an additional amount for "Construction and equipment", $24,250,000, as follows:

(A) Jet Propulsion Laboratory, Pasadena, California: New facilities, improvements to existing facilities, and approximately seventy acres of land, $9,000,000; and

(B) Various locations: Global range tracking and communication facilities and equipment, and propulsion development facilities, $15,250,000.

(b) Authorization is hereby granted whereby either the amount prescribed in subparagraph (A) or the amount prescribed in subparagraph (B) of subsection (a)(3) may, in the discretion of the Administrator of the National Aeronautics and Space Administration, be varied upward 5 per centum to meet unusual cost variations, but the total cost of all work authorized under such subparagraphs shall not exceed a total of $24,250,000.

SEC. 2. Any amount, not to exceed $500,000, of the funds appropriated pursuant to authorization of subsection (a)(3) of the first section for the construction of facilities described under such subsection may, with the approval of the Bureau of the Budget, be used for the construction of new research facilities or for the modification of existing research facilities not specifically authorized in this Act, if such construction or modification is deemed by the Administrator of the National Aeronautics and Space Administration to be of greater urgency than the construction of any facility authorized by this Act; but no such funds shall be used for the construction or modification of any facility if funds for such construction or modification have been previously denied by the Congress.

The CHAIRMAN. We have a list of witnesses this morning that is really imposing: Dr. T. Keith Glennan, Administrator; Dr. Hugh L. Dryden, Deputy Administrator; Dr. Abe Silverstein, Director of Space Flight Development.

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We also have Mr. E. M. Cortright, Mr. John W. Townsend, Jr., Mr. DeMarquis D. Wyatt, Mr. Ira H. Abbott, Mr. James P. Gleason.

We are happy to have all of you gentlemen here this morning. To expedite the consideration of this measure and also to consider it in an overall manner, I am going to call Dr. Glennan, Dr. Dryden, and Dr. Silverstein first, and ask that they proceed and give their testimony and we will consider it all together.

After that we will ask questions of any one of these three witnesses. Dr. Glennan, we are happy to have you here again, sir.

STATEMENT OF DR. T. KEITH GLENNAN, ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Dr. GLENNAN. Thank you, Mr. Chairman. I have a statement which I would like to read if I have your permission.

The CHAIRMAN. Will you proceed, sir.

Dr. GLENNAN. Mr. Chairman, I appreciate the opportunity of appearing before this committee to discuss NASA's supplemental budget request for fiscal year 1959. This supplemental added to the 1959 funds available will provide a total sum which will enable us to carry forward our national space program with speed, effectiveness, and efficiency.

Research and development in the space field is a fast-moving, fluid, expensive business, one which requires a continuing review of programs in the light of new developments. In many ways it is a new field requiring the development of new instrumentalities of research. We should not allow ourselves to be lulled into a belief that the few but very important successes we have thus far experienced mean that the way ahead is clearly illuminated—that the program to be followed is one which can be frozen now, financed and pursued to a well-defined end point. But the signs are encouraging and we have every confidence that success will attend our efforts. And, while we as taxpayers must expect higher budgets in the years to come, we have, on the other hand, every right to expect ever-higher returns on our investment in terms of national security, world leadership, and our national economy.

As one might expect, we are frequently asked to justify the sums we are spending, and plan to spend, in space research. Where, and when, does the "payoff" come?

The answer must be measured in terms of our progress toward our objectives in space. These are, first, the enhancement of our national security with all this implies; second, the advancement of basic knowledge about the earth and the universe in which we live; and third, the economic benefits for this Nation and ultimately, for all mankind. In this latter area, it is clear that we are moving rapidly from the realm of possibility into the realm of probability.

As for the first of these objectives, NASA's primary mission is to direct U.S. space activities for peaceful purposes, but the National Aeronautics and Space Act of 1958 also stipulates very clearly that NASA shall make available to the armed services all discoveries that have military significance.

For 43 years our predecessor organization, the National Advisory Committee for Aeronautics, had the closest possible relationship with the military, and NASA is following in that tradition. There is

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hardly an airplane or a missile flying or on the drawing boards, that does not incorporate importantly the research efforts of our organization.

Secondly, in the all-important effort to advance basic knowledge, it is of course impossible to predict the precise nature of what we will learn. As you know, our satellites and space probes have already provided new knowledge about such phenomena as the great radiation belt and about the shape of the earth that may have profound effects upon future science and technology.

In this area we have made only a beginning. In the days ahead we will be sending data-gathering instruments, and then man himself, into space in search of new knowledge.

Finally, as a Nation we are bound to benefit economically, and sooner than many would have imagined possibly even a short time ago. For example, Vanguard II, the cloud cover satellite now in orbit—in itself a very great accomplishment—is but the first significant step on the road to development of a global weather forecasting system.

Communications satellites also offer great promise. They will make transocean television possible, to say nothing of improved worldwide radio transmission and other communications improvements. In addition to the Atlas-boosted communications satellite, each of the space experiments carried out today has added to our conviction that such global communications systems, with a high probability of economic return, will be operationally feasible within the next few years.

As we consider developments such as these, we have only to look back over the last 50-odd years at the incredible advances in aeronautics to gain a perspective about, and confidence in, what may be expected to occur in the first half century of the space age.

As a world leader, the United States carries a heavy responsibility to pursue its national objectives with great vigor. All of us—the Congress, the administration, and the taxpayer must share in this responsibility.

Thus far, NASA's efforts have been financed with a budget of nearly $336 million for fiscal 1959. We are now requesting $48,354,000 as a supplemental to that 1959 budget. To be specific, this supplemental calls for: $20,750,000 to spur research and development of our manned satellite program, Project Mercury; $3,354,000 to cover salary increases provided by the Classified Pay Act of 1958. This sum does not provide for additional position; $9 million for NASA's recently acquired jet propulsion laboratory in Pasadena, Calif., to buy 70 acres of land, to improve these existing Government-owned facilities, and to erect new facilities; $12,050,000 for new tracking stations and equipment here and abroad; $3,200,000 for propulsion-development facilities for testing the 1 to 1½ million-pound thrust, single-chamber rocket engine.

The funds for JPL are necessary because the increasing energy levels of the rockets to be tested demand facilities with wider margins of safety in order to meet provisions of the pertinent safety codes and the demands of a rapidly developing technology.

The necessary land contiguous to the present JPL site will cost $375,000; relocation of utilities, $2,775,200; and relocation of test facilities, $2,255,000. New facilities will account for $1,488,000 plus $175,000 for a new electrical substation and transformer bank.

The $12,050,000 requested for tracking equipment is needed now because of the long leadtimes involved in the production of complex electronics facilities. Of this sum, $3,300,000 will provide four Minitrack stations—two in the United States and one each in Newfoundland and Europe. This will also cover new equipment for other stations in the world-wide Minitrack network.

Another $3,500,000 will pay for tracking installations in Australia and the Union of South Africa.

The remaining $5,250,000 is for the development of radar, tracking and communications systems for use in Project Mercury.

Further to support this urgent request for a supplemental appropriation for fiscal 1959, I'd like to talk for a moment about 1960 and the years beyond.

NASA budgetary requirements for fiscal year 1960, our first full year of operation, total $485,300,000. This sum represents increases of $11,330,000 in salaries and expenses over 1959 and $9,800,000 in construction and equipment items for the same period. The research and development request—$333,070,000—is an increase of $129,460,468 over fiscal 1959.

These figures underscore the point that we have to expect increasingly higher budgets in the years immediately ahead. I want to emphasize that today we are merely making downpayments on programs that will cost very much more in the future.

Project Mercury, for example, is budgeted at $37,661,200 in fiscal 1959 and we are asking $20,750,000 in supplemental funds. The 1960 cost of the project is $70 million. We will probably have spent $200 million before man has made his first orbiting flight.

The 1½-million-pound thrust engine is a $12 million item in the 1959 budget. This will increase to $30,200,000 in 1960, and its total cost will probably exceed $200 million.

As I have previously testified, an orderly but determined research and development program will be apt to require support at the level of about $1 billion annually within about 2 or 3 years.

Selectivity based upon sound judgment is now one of our greatest tasks. From within and without, NASA is receiving a heavy volume of research and development proposals. To pursue any substantial number of them concurrently would run into billions upon billions of dollars. Even if we had such sums, we couldn't possibly spend them effectively at this stage. So we must choose the best project and exert ourselves to the limit to carry them out.

Here is an example of what I mean: Our current rocket boosters are capable of launching only what we call "first generation" experiments; that is, small payloads possessing limited research capabilities.

Satellite and space probe launching systems thus far employed have been based largely upon rocket boosters designed for military missions. Without in any way reflecting upon their effectiveness in performing their primary mission, it is now clear that they possess limited capabilities for our purposes.

Our rate of progress in the space sciences program is handicapped by our lack of an adequate payload capacity. Even with exceptional efforts to miniaturize experiments there are very real limitations to the scope of the experiments which can be mounted upon the presently available launching vehicles.

It has become evident that the law of diminishing returns will operate if we devote our major effort to first generation experiments which are inherently incapable of providing more than limited data in return for the substantial outlays of funds, personnel, and time involved.

We must, of course, continue our satellite and space programs but it is imperative that we place a major effort on the development of larger boosters and upper stage rockets—in fact, complete vehicle systems—designed specifically for their space missions. Money spent for propulsion systems development now will make much more certain and much more economical the undertaking of scientific investigations in the years immediately ahead.

In this regard, we are working with the Department of Defense on an integrated national space vehicle program. By the end of 1960 we hope to have available the first units which will give us substantially greater payload capability. Only when these become available will scientists be able to carry out such second generation experiments as advanced meteorological and communications satellites.

Along with the space vehicle program, we must also improve our tracking and data reduction capabilities, and perfect our payload instrumentation techniques.

Now, to accomplish all of its missions, NASA is calling upon the talents of a wide range of governmental, industrial, and educational organizations. For example, NASA is working closely with the Space Science Board of the National Academy of Sciences in the development of its space sciences program.

On the international front we are cooperating with the Committee on Space Research (Cospar) of the International Council of Scientific Unions and the United Nations. Our tracking stations abroad are manned, in some instances, by nationals of the countries in which they are located.

In the field of payload experiments and packaging, we work with a number of agencies and organizations. Universities, industry, and government have all had a hand in preparing experiments for satellites and space probes, whereas to deal with four principal groups with payload packaging, capability—JPL and the Vanguard group (both within NASA) ; the Space Technology Laboratories, Inc., Los Angeles; and the Army Ballistic Missile Agency in Huntsville, Ala. A number of industrial organizations also have a developing capability in payload packaging.

Lastly, let me refer to the staff and facilities with which we plan to get these jobs done.

We inherited from NACA a staff of some 8,000 exceptionally capable scientists, engineers, and administrative workers in five laboratories and field stations in Virginia, Ohio, and California. We also took over their fine research facilities and programs.

With the recent acquisition of JPL at the California Institute of Technology, we have obtained a 2,300-man organization with a high order of competence in electronics, guidance, propulsion, systems analysis, tracking, and telemetering.

We have also acquired the Vanguard group from the Naval Research Laboratory under Dr. John P. Hagen. Including 25 individuals from other NRL divisions, they number 158 persons.

As it now stands, we expect to have 8,961 employees on July 1, 1959, and 9,988 by July 1960. (These figures are exclusive of the JPL employees.)

By way of summary, I believe that we will be able to press forward vigorously a substantial space program financed in the amounts requested in the supplemental, followed by the fiscal 1960 budget requests which will be detailed at a later date. I am confident that with these sums we can prosecute an effective program.

The CHAIRMAN. Thank you, Doctor. You are flushed with victory over the success of your recent missile probe, and I think on behalf of the committee that you ought to be congratulated for that real achievement. Do you have anything new in reference to that particular accomplishment?

Dr. GLENNAN. I would say, Mr. Chairman, your congratulations really extend to a great, great many people, and that we are simply proud to be the organization which pulls these people together and gets this kind of a job done. We would ask Dr. Silverstein if he has any recent information that would add to what has been released thus far and given to your committee.

Dr. SILVERSTEIN. I am not aware whether your committee has heard the final orbit around the sun that the body is moving into, but we know now the dimensions of the orbit it will enter into, a distance of about 91,700,000 miles, in its closest approach to the sun, and a distance out that is about 105 million miles from the sun. These are numbers that have been calculated based on the latest tracking data obtained at our station.

The CHAIRMAN. Then it is sometime at a point about 105 million miles from the sun?

Dr. SILVERSTEIN. Its most distant point from the sun in its orbit around the sun.

The CHAIRMAN. You haven't heard anything from that missile since it attained a distance of 408,000 miles, have you?

Dr. SILVERSTEIN. No, sir. The power was gone at that point. We tracked it for some 82 hours, at which time it had reached a distance of about 490,000 miles.

The CHAIRMAN. You have had no contact with it, of any sort, since then?

Dr. SILVERSTEIGN. No, sir.

The CHAIRMAN. Dr. Dryden, we are happy to have you here this morning. Do you have a statement sir? I don't think it is a prepared statement for the committee, but nonetheless, we certainly are glad to have your statement and your ideas on the bill.

Dr. DRYDEN. Mr. Chairman, my function this morning is to serve as master of ceremonies, presenting to you a broad brush treatment of our program so that you may be enabled to judge this supplemental in the light of the whole program.

I myself will later give one of the presentations, but we wish to begin with Dr. Silverstein talking about the developments in advanced technology, particularly in boosters.

The CHAIRMAN. Dr. Silverstein.

STATEMENT OF DR. ABE SILVERSTEIN, DIRECTOR OF SPACE FLIGHT DEVELOPMENT, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Dr. SILVERSTEIN. I have a chart presentation, so I will move back to the charts, if I may.

The CHAIRMAN. Do you want to proceed with that at this time, the chart presentation?

Dr. SILVERSTEIN. Yes, sir.

The CHAIRMAN. All right, sir, just proceed, sir.

Dr. SILVERSTEIN. I think in reviewing the flights that have been made recently, including both satellites and probes, and recognizing the weights that may be carried into orbit and out into deep space, most of us have become aware that the major weakness in our program is in the size of the boosters that we have to carry these payloads.

We have inherited, as Dr. Glennan said, from the missile program which has been carried on vigorously in the past few years, a number of vehicles that have been adapted to space flight uses.

There has only been one vehicle that was started from the very beginning in its development as a true space vehicle. This was the Vanguard vehicle, which several weeks ago fired a weather satellite into an orbit.

I would like to start off by reviewing briefly the current status of our boosters, and then move on to show you what we have included in this most urgent booster development program that we have in process.

I show here a Vanguard vehicle which was described to this committee a short time ago. Next, the Jupiter vehicle. With this vehicle, the Explorer satellites were put in orbit. The payload carried by this vehicle into orbit was 13.4 pounds.

The next vehicle we have here is the Juno II, which is the same as the Jupiter C, except that as the basic booster we use the Jupiter booster.

Here I show the Thor-Able vehicle, which was the vehicle used in some of the earlier shots to the moon. It consists of the basic Thor, IRBM booster, with the second and third stages formed by taking the top stages from the Vanguard vehicle.

With this vehicle, we can place into orbit about 150 pounds of weight, and depending on the depth of the probe shot, we may send as much as 50 pounds into deep space.

All of these vehicles have some things in common. They all—as are these last three vehicles—are adapted from basic military vehicles. None have guidance in the top stages. The guidance extends up to the point of ejection by the principal booster, after which, through spin of the upper stages we attempt to hold the probe of the satellite along the path which it had at the time it was separated from the principal booster.

Because there is no guidance in these other stages, we have found that we are not coming as close to the objectives of our programs as we would like. For example, you will recall that we set out in our moon shot to come withing about 10,000 miles of the moon. This was our objective.

However, we came within 30,000 miles of the moon. This divergence was due to the fact that at separation between the stages there was

a tipoff, a slight dispersion, between the upper stage and the lower stage, which could not be corrected thereafter.

So one of the most important things for us to do as we move along with the missile program is to provide guidance in these upper stages. You will see later in the program that this is being accomplished.

These vehicles include ones we now have, and others soon to be available. This vehicle, the Thor-Hustler, is currently available, and was used just last week on the Discoverer project.

This is the Atlas-Able comprised of the basic Atlas ICBM missile, with the Vanguard second and third stages on top. The Atlas-Hustler is made up by combining the Atlas missile with the top stage from the Thor-Hustler. Because of the greater thrust of the basic Atlas missile, this combination gives you greater payload capability in orbit.

These vehicles shown here, and these other vehicles, are what we have and what we have coming along during the year.

The vehicle called the Scout here is a new vehicle in the program, made up by combining solid rockets that now exist, or largely exist—with some development required in the third stage rocket. By adding these four stages of solid rockets together we hope to accomplish two things: One, to produce a satellite vehicle that will carry 150 pounds of payload into 300-mile orbit, and secondly, to produce a vehicle which, because we are using solid rockets which are very reliable and very economical, will give us a capability in space at a price that perhaps will be as low as one-fifth of that which we are currently spending to put comparable loads into orbit.

The CHAIRMAN. What is that price?

Dr. SILVERSTEIN. We are expecting that these vehicles after development will cost about $400,000 apiece. We currently are spending from $2.2 to $2.6 millions for vehicles with comparable capability.

Let me move along to show you the elements of our advanced program. On this chart which we call advanced boosters, I show the Centaur on the left and the Vega on the right, two new boosters which are part of the national booster program. As Dr. Glennan mentioned, we have been working together with the Defense Department to create what we call a national booster program.

We have prepared a program, and have outlined, based on the needs both of the civilian agency and of the military, a series of boosters of increasing capability which are projected several years ahead.

This is the first of the new vehicles in the series, called Vega. What we do is to add on top of the existing ATLAS a new stage which has been designed from scratch to mate perfectly with the ATLAS.

The stages I showed previously—for example in this chart I mentioned the Atlas-Able, where we used the Atlas as a basic vehicle——

The CHAIRMAN. Pardon me just a moment, Doctor. Mr. Roush, can you see the presentation?

Mr. ROUSH. I see sufficiently, yes, sir.

The CHAIRMAN. Can you see from over there, Mr. Ducander? If you can't, move in closer, gentlemen, and you will be able to see a little better. Go ahead, Doctor.

Dr. SILVERSTEIN. Here we used the Atlas vehicle as the basic booster. However, we have improvised by taking a stage from the Vanguard to put on top of it. This is done to give us current capability.

However, in doing it, we sacrifice a number of things. We sacrifice guidance in the upper stages and we sacrifice the true potential of the Atlas as a payload booster.

So we are moving rapidly toward the development of this new Vega vehicle. The stage we are putting on will be fueled by liquid oxygen and kerosene. It will have a capability of putting about 6,700 pounds into a satellite orbit at 300 miles and placing from 800 to 900 pounds in an orbit around the moon.

The companion development to the Vega is the Centaur. You will notice this vehicle shown on the chart is taller than the Vega because this second stage between here and here is a longer stage than this stage of the Vega. It is longer because it is fueled with liquid oxygen and hydrogen. This vehicle is the first vehicle in which we are planning to use the new high-energy fuels.

Hydrogen is a good fuel because it has an energy content that is some 2.7 times that of kerosene. It has a heat content of some 50,000 B.t.u.'s per pound as compared with around 18,000 B.t.u.'s per pound for the kerosene.

In combination with liquid oxygen as an oxidizer, this will give us an impulse at altitude in the order of 415 seconds as compared with about 310 seconds for the lox-kerosene. This impulse that I mentioned here is very important in deep space missions.

For example, this change in impulse, which is the pounds of thrust per pound of fuel burned per second, is a measure of the efficiency of the system, and we find that if we increase the impulse for satellite uses that we get a gain in load-carrying capability of about the square of the gain in impulse.

If we increase the impulse by 50 percent, we get about two and a quarter times the load-carrying capability.

However, when we attempt deep space probe missions such as the missions out to Mars and Venus, the gains are many times these and can amount to as much as 10 times the percentage gain in impulse.

Both of these stages are currently in the process of contract and development. Of interest here in the Vega stage, so that we can move it rapidly, we have used an engine that exists and are simply modifying it. I will show you later the new engines that are involved in our whole booster system, but I make the statement here that one of the basic objectives in developing this whole system of boosters, one of the basic premises, was that we should attempt to do it as a family development with the fewest number of new rockets to be constructed.

Mr. MILLER. What will be the size of the boosters on this?

Dr. SILVERSTEIN. The booster rockets?

Mr. MILLER. The rocket.

Dr. SILVERSTEIN. The size of the rocket in this Vega stage, and also the Centaur, is around 30,000 pounds of thrust.

Mr. MILLER. That is the thrust of the original as it leaves the ground?

Dr. SILVERSTEIN. The Atlas? The Atlas has a thrust of about 355,000 pounds takeoff at sea level.

The CHAIRMAN. You say that adds only 30,000?

Dr. SILVERSTEIN. Thirty thousand pounds of thrust in the second stage.

The CHAIRMAN. In the second stage?

Dr. SILVERSTEIN. The Atlas vehicle really is a one-and-a-half-stage vehicle. The Atlas boosts off with the two primary engines burning, and also the smaller center rocket burning, and after some 120 seconds, the big rockets go out and still leave the smaller rocket in the middle burning.

So you effectively get one and a half stages. Then this goes on top and it is really the second and a half stage.

Beyond these two vehicles we come to even more advanced boosters. We show here next the clustered booster. This booster is currently under development at the Army Ballistic Missile Agency at Huntsville. It will have a thrust of from 1 million to a million and a half pounds at different stages in its development. It is made up by clustering existing engines that have been used and are being used now to power the intermediate ballistic missiles and the intercontinental ballistic missiles.

They are fed from tankage located here.

On top of the cluster we put the top stages including a second stage, a third stage, and for some missions we will use four stages. These upper stages will all have guidance so that we can accurately direct the payload to any point we choose.

Mr. FULTON. What is the name of that?

Dr. SILVERSTEIN. The name of this currently is Saturn.

The CHAIRMAN. We have heard that before.

Mr. FULTON. That is at the Redstone Arsenal. What is the name of the big one? That is Project Nova, the 6-million-pound cluster?

Dr. SILVERSTEIN. This is Nova. This is the large one.

Mr. MILLER. How do you spell it?

Dr. SILVERSTEIN. N-o-v-a. Let us move now to the 6-million-pound cluster. I think you are aware of the fact that we are currently developing a rocket engine at Rocketdyne Co. that will have from a million to a million and a half pounds of thrust developed in a single rocket chamber.

The CHAIRMAN. When is that going to be ready?

Dr. SILVERSTEIN. Currently it is scheduled for about a 4-year period of development. We will group the engines together to form a cluster as shown here in the sketch. On top of that we will mount one of these engines with its tank system, and then we will place on top of that some of the new stages that will have been developed as we moved through the full booster system development period.

You might ask the question, as we reach a stage here with 6 million pounds of thrust, "Is this the largest system we can see in the future, and why did we stop our development here?"

Currently I think we can say that we will need boosters of greater capability in the future. I think it is appropriate that we use this step as a final one in our chemical development and take a look, a good close look, at the possibilities of nuclear power for greater capability.

As part of this booster development, we need only to develop five new engines, as listed on this chart. One is a 6,000-pound storable propellent engine, one is a 15,000-pound lox-hydrogen engine, one is a 20,000-pound storable propellent engine, one is an 80,000-pound lox-hydrogen engine, and one is this million-and-a-half-pound lox-kerosene engine, lox, of course, refers to liquid oxygen.

Currently the 6,000-pound engine is under development at the Jet Propulsion Laboratory, a NASA facility operated through Cal Tech.

Here we have a 15,000-pound lox-hydrogen engine which is currently under development.

The 20,000-pound storable propellent engine, which is being studied, is not as yet under development. We have had the 80,000-pound lox-hydrogen engine under study for a period of about a year. And this million-and-a-half-pound rocket, which I discussed a few minutes ago, is currently under contract.

So you can see that the major elements—the engines of the program—are well along the road.

The CHAIRMAN. I wish you would tell the committee, Doctor, why it is necessary to develop those different types of engines. Why wouldn't it be preferable to put all of your attention on that million-and-a-half-pound engine? I wish you would explain to the committee, why that is necessary.

Mr. FULTON. Supplementing that question, would you explain, too, why you switched types of engines in midpassage from lox-hydrogen to storable, and then back again?

The CHAIRMAN. Will you add, too, what you mean by storable?

Dr. SILVERSTEIN. Yes, I will. Let me answer first the question you have asked about why do we have different thrust engines, and why do not we concentrate all of our attention on the large engine.

In any multistage booster, such as we require to put loads into space and into satellite orbits, the different stages of the rocket necessarily must go down in thrust from the first-stage booster on through to the later stages, because, as you can see, the first-stage booster must lift the payload and all the stages above it.

Because each of the succeeding rockets needs only to lift the payload and the stages above it, we are able to use smaller thrust engines in the later stages of the rocket.

The ratio between the thrust of the different stages for satellite operation is generally in the range of about 4 to 1 between stages.

Mr. FULTON. I was going to ask you, could you give us the ratio of thrust on the various stages on those engines?

Dr. SILVERSTEIN. I can, sir. Let me get, next, to the question you have asked regarding why we change fuels in the rockets.

On my first chart I showed the Centaur stage and I called attention to the fact that this was a lox-hydrogen stage, whereas in this vehicle I have used lox-kerosene. This stage will represent the very first stage in which we are attempting to develop the technology for the use of hydrogen. We are well aware of the fact that, if we can successfully use hydrogen in these stages, we can get greater efficiency. But as yet nobody has demonstrated in flight that hydrogen can effectively be flown, keeping in mind the fact that this is a cryogenic material which has a boiling point of something like minus 430 degrees Fahrenheit. This has to be tanked. It has to be kept cold during the basic booster phase or the pressure in the tanks will rise so high they will burst. So they have to be insulated. We have to worry about freezing of the lines and the pumping of this material. The technology here is not developed enough so that we would wish to take the chance of having the whole program fail because we do not develop this technology rapidly enough.

Mr. FULTON. On that point, why don't you switch to a solid-propellant gas generator? Why go to hydrogen?

Dr. SILVERSTEIN. As a fuel, sir?

Mr. FULTON. Yes. Use a solid propellant instead of going to hydrogen. Why did you switch to hydrogen?

Dr. SILVERSTEIN. The number of pounds of thrust per pound of fuel per second is the critical element in the upper stages of a booster. This tells you how much load you can carry and how far you can go with the load you have.

We could possibly reach an impulse of 430 with this hydrogen-lox combination. Currently a figure of 285 would be my best estimate for a solid fuel rocket.

The difference in these two numbers becomes very critical, when we launch our missions into deep space.

This rules out the use of low efficiency fuels in the latter stages.

Now, with respect to storable materials. What are they? Storable materials are materials that——

Mr. FULTON. Would you just hold there a minute?

Dr. SILVERSTEIN. Yes, sir.

Mr. FULTON. In fact, you only need the extra energy when you are talking about deep space because on other types of flight you would have excess energy, wouldn't you? You do pretty well with a solid fuel and you might get better percentage of successes. So it is only in the deep space probe that what you say is logical.

Dr. SILVERSTEIN. Let me say it this way: for any mission, the greater your efficiency, the greater will be the payload that you will be able to carry in relation to the weight of the vehicle.

You have argument on your side in saying that for the less difficult missions you do not need as refined a fuel. So we do have for the less difficult missions this Vega stage with the lower energy propellants and the propellants that can be handled a great deal more easily.

The CHAIRMAN. As I understand it from you then, you use that type of propellant there, rather than a solid propellant, because you get a greater efficiency to lift up the solid propellant in the upper stages?

Dr. SILVERSTEIN. To lift a storable propellant in the upper stages.

The CHAIRMAN. Storable propellant. You were going to tell us about what storable is, what you have in mind there.

Dr. SILVERSTEIN. A storable propellant is one that, as the name indicates, can be stored. For example, two materials we are interested in in this connection are hydrazine and nitrogen tetraoxide. These are of current interest as storables. These fuels can be put in the tanks and left in the tanks for periods up to 2 years, and the fuel will remain in its original condition and we can expect that the rocket will fire with no difficulty after that period of time.

As we look forward to flights into deep space, for example, we may wish to fly to Mars and then do an orbit around Mars. In order to do that, more than 200 days after we fire the rocket from the ground we must be prepared to turn on another rocket that will in retrofashion give us thrust so as to put us into orbit around Mars.

This means that we need a material that is storable for that period of time. So we go to these storable propellants for the very upper stages.

The CHAIRMAN. Why don't you use them in the lower stages? Is it less efficient?

Dr. SILVERSTEIN. They could, of course, be used in some of the lower stages. One of the points I would like to call your attention to is this: We are designing our million-and-a-half-pound-thrust rocket so it will operate either with the cryogenic materials like lox-JP or with the storable propellants. But here is an interesting number. The current costs of these storable propellants are such that if we were to develop this rocket with storable propellants instead of the cryogenic propellants it would cost us another $40 million.

The storable propellants now are costing in the neighborhood of $3.50 to $5 a pound, whereas we buy our lox and JP for a few cents a pound.

This is the reason we continue to use the cheaper fuels. In the very upper stages, of course, there is not a great deal of fuel required so the cost of the fuel doesn't become an important item.

The CHAIRMAN. Thank you very much, Doctor. Does that complete your general statement?

Mr. FULTON. We have one more question on your fuel.

Dr. SILVERSTEIN. I have a few more charts.

Mr. FULTON. Before you leave the fuel, if you are going up in the power of the fuel, if you have not had experiments already with cesium with a molecular weight 37 times that of hydrogen, I imagine it is much more powerful, isn't it?

Dr. SILVERSTEIN. It turns out in a liquid rocket quite to the contrary. To get high efficiency, you want low molecular weight. This comes about by the basic equation for the rocket engine which goes something like this, that our specific impulse is proportional to the square root of the temperature over molecular weight. The temperature is on top so we want a high temperature to get a high impulse. Underneath it we have molecular weight and we want to have that low. Hydrogen, of course, has the lowest molecular weight of any of the materials we can use and this is why hydrogen is a good fuel.

Mr. FULTON. So actually there is no use then experimenting with cesium for these distant flights, deep probes?

Dr. SILVERSTEIN. There is a point here, there is reason for experimenting with cesium. This gets into another type of powerplant, not the chemical powerplant, but rather the electric propulsion system, where we can use these readily ionizable materials like cesium.

Mr. FULTON. Would you use that on an ion propellant then? Is that what you are saying then?

Dr. SILVERSTEIN. Exactly, sir. This is the material we would use in an ion propulsion system.

The CHAIRMAN. Just proceed, Doctor, with your charts.

Dr. SILVERSTEIN. I have a few charts I will run through very rapidly. Just to show the gain in capability that is associated with the growth in the booster development. You will recall in my charts I showed existing capabilities, capabilities soon available, and then the Atlas vehicles, the Vega, the Centaur, the million-pound-thrust cluster, and the 6-million-pound-thrust cluster.

These charts, first for the 300-mile satellite orbit shown here, show the payload in thousands of pounds that can be carried within these different vehicles in this orbit. You can see the capability of increasing from this nominal 100 pounds up to some 150,000 pounds with the growth of boosters.

One might have a hard time—and maybe not—defending this booster for this payload. I will show in some of these later charts other reasons that we need the advanced booster.

Here we find a very interesting orbit that we will be quite anxious to put satellites in as rapidly as we can. This is the 22,000-mile orbit. In this orbit it turns out that the satellite has a 24-hour time period. Since it has a 24-hour period and the earth is turning once every 24 hours, this satellite will appear to remain overhead.

Why is this of interest? We are interested because for communications purposes, for example, we might consider spacing three of these overhead satellites around the world and relaying messages from one to the other, thereby having a worldwide communications network. So this is an interesting orbit.

Another thing: we find that in order to discuss communications satellites we look for loads that are even greater than the capability shown here. A 3,300-pound satellite can be placed in orbit with this million-pound cluster. But because of the power requirements, say for broadband communications such as are required in television programs, you need power sources that will run the weights up higher than even this 3,300 pounds.

We are looking for 5,000 pounds now. We will be looking for 10,000 later.

So we must take this step to provide this capability.

Going to other missions, such as payloads for lunar landing, these are the capabilities. We have none with our existing vehicles. We will have a very small capability with the vehicles soon to be available. We come out finally to where we will have a capability up to about 20,000 pounds with this 6-million-pound cluster. An interesting point, however: If you wish to make a soft landing on the moon and then return to earth, your capability drops to some 2,000 pounds. This means that this vehicle, the 6-million-pound cluster that you saw on an earlier chart, is the first vehicle we can hope to have that will take a man in capsule to the moon, land him there, and bring him back.

So if we are looking toward this type of exploration, which I know all of us are, we must move as rapidly as we can to accomplish this type of propulsion.

The CHAIRMAN. Even then, though, you have very little payload capacity to bring the man back in.

Dr. SILVERSTEIN. I think we could say, sir, that 2,000 pounds is an absolute minimum for providing the services for the man. It may be too small. It is a marginal thing.

Mr. FULTON. Could you then, Doctor, give us the time schedule that you have set up for putting the man on the moon and bringing him back? When will you have that capability?

Dr. SILVERSTEIN. It will take about 4 years to develop the basic rocket engine here, but it is going to take some time beyond that to put these rockets into the cluster, and to develop the tankage and the systems that go with it.

Mr. FULTON. What do you estimate?

Dr. SILVERSTEIN. This I think would be at least another 2-year period. So at the earliest, if all the rest of the technology that you need to develop here—communications technology, the knowledge regarding the radiations in space that might be dangerous to a man,

the knowledge regarding how much shielding this man has to have in order to protect him in outer space—if we knew all these other things, then this particular piece of technology would take 6 years.

The CHAIRMAN. May I say this to the gentlemen: Are you through Doctor? If you are through, we will open up the questions. I know everybody has a good many questions to ask.

Go ahead and finish, sir.

Dr. SILVERSTEIN. May I make one point? At what point do we introduce nuclear propulsion into the system? My answer there is: At as early a time as we can, consistent with the state of the art. I think you know now we have research and development programs underway on nuclear rocket programs. There is progress. We would like to see what the relative performance will be of a nuclear system at an upper stage as compared with the chemical system.

Now take a really difficult mission, such as sending a payload to Mars with the idea of returning it to Earth. If we assume that we would use our big 6-million-pound cluster to put 150,000 pounds into a 300-mile orbit, and would then take off from this 300-mile orbit into deeper space, we can show numbers for flight performance using a chemical rocket as compared with flight performance using a nuclear rocket. The comparison is this: That if we simply want to take the payload to Mars, using the chemical system, we can show that with the 6-million-pound booster we could send 7,500 pounds to Mars; whereas with the nuclear upper stage, we might send 55,000 pounds on the same mission.

If we want to return this payload—of course if it is manned, we certainly want to do so—we find that we can return only 750 pounds with the chemical upper stage, as compared with 25,000 pounds with the nuclear upper stage. This, I think, demonstrates most clearly that for the really difficult missions such as a trip to Mars and return, and in the upper stage application, there is no question about the desirability of going ahead as rapidly as we can with the nuclear stage.

Thank you.

The CHAIRMAN. I want to thank you three gentlemen for your statements. Dr. Dryden, you had finished your statement, had you?

Dr. DRYDEN. We have a series of presentations. I have the one on the manned space program. I don't know how you want to proceed—whether to have a discussion after each one or——

The CHAIRMAN. I think it would be better, to finish in 3 days, perhaps we had better go ahead and get your presentation.

STATEMENT OF DR. HUGH L. DRYDEN, DEPUTY ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Dr. DRYDEN. As you know, one of the highly urgent projects in our program is Project Mercury, and one of the principal items in the supplemental budget which is before you for authorization concerns additional funds for this project. I begin simply with a list of milestones for man in space. Many such lists have been made. This is a typical one, beginning with the X–15, which is an intermittent type of space craft in that it can take a man into space very briefly and bring him back within a relatively few minutes.

Project Mercury, in which our effort is very intense, with the objective of placing a man in orbital flight in the simplest possible vehicle.

The next step would be to go to advanced concepts which would permit a more accurate control of the vehicle within the atmosphere so there might be some prospect of landing on an ordinary landing field.

Beyond that, the putting into orbit of several men for several days. Following this, the manned orbiting space laboratory, manned flight to the vicinity of the moon, manned landing on the moon and return, and interplanetary flight.

I think it is clear from Dr. Silverstein's talk that we are thinking about all of these missions. We are doing some studies on all of these missions and some beginnings on experimental work. However, most of our development effort is on the Project Mercury. Research effort covers the later fields.

The objectives of Project Mercury were rather simple ones, of putting man in orbital flight and recovering him safely, and to study something of man's capabilities in the space environment.

Will he be collected enough in thought to communicate with us and talk to us at all times? Will he know where he is and be able to navigate? Will he be able to do certain types of control functions?

I might have added a third one. I think that this project will be the means of a great acceleration in the development of space technology in many of its aspects.

The basic principle or basic philosophy of this project was to use the simplest and most reliable approach to rely on the minimum of new developments and not to wait for the successful completion of some research whose results were at present unknown, but so far as possible to stay within the present state of the art, and to proceed with this mission, not by suddenly launching a man into orbit in an untested vehicle, but to build up through a progressive series of tests, as I will describe, to this final accomplishment.

Everyone who has studied this mission comes up with the simplest vehicle, the so-called drag vehicle, or stated in another way, the substitution for the nose cone of a ballistic missile of a capsule containing a man, to launch this into orbit with an ICBM booster—specifically the Atlas. To use as a method of getting down, the firing of retrorockets which would slow up this orbital vehicle and cause it to spiral inward toward the earth.

To accomplish the final landing by means of a parachute system. And to incorporate in the design an escape system so that the man would be able to get out safely from all of the accidents we could conceive, even the burning of a booster on the launching pad or a failure to get into orbit.

The capsule is here shown schematically, and there is a model on the table that will show you the picture first. There is a pressure vessel so that the man can be maintained at the normal conditions of atmospheric pressure with an atmosphere he is used to. For safety reasons, he also wears a pressure suit. There are certain contingencies under which we think this might be very useful to have. For example, the easiest way of dealing with a fire if such a thing should break out in this capsule when it was in space would be to vent it to the outside to a vacuum so that the fire goes out. If he is in a pressure suit, this can be readily done. The man is supported on a couch which is molded to fit his form. This is for the purpose of protecting him against the accelerations on launching when the

missile boosts this into the air. And also to protect him from the accelerations during reentry to the atmosphere. And perhaps most importantly of all, against a somewhat higher acceleration that would be encountered in an abortive mission in which the capsule failed to achieve orbit and it was necessary to reenter the lower atmosphere under somewhat less favorable conditions.

As I will explain later, the attitude of this capsule must be controlled. The heat shield against the reentry is at the bottom. This would also protect him momentarily against fire if he had a fire in the booster.

So there are provided pitch and yaw jets and roll jets to control the attitude and to turn it through 180 degrees so it reenters the atmosphere blunt end first.

This particular method of supporting the man has been tested very thoroughly in a centrifuge at Johnsville with the cooperation of the Navy, and several volunteers have been subjected to accelerations greater than 20 times gravity without any damage to the man. This means, of course, that his apparent weight is something like 3,000 pounds under those conditions.

So that this protection of the man against the accelerations has been very thoroughly worked out and demonstrated. Retrorockets are shown below. The container for the parachutes for the recovery are here.

On top of this capsule—I can show you better with the model—is the escape system which is used in the lower atmosphere. It consists of this triangular frame supporting a rocket some distance above the capsule. This rocket has sufficient power when ignited to launch the capsule high into the atmosphere so that the parachute recovery may operate.

When the altitude gets beyond the sensible atmosphere, this A-frame is discarded. It was put on here so well that I probably can't get it off. I will leave it there. At higher altitudes, recovery from an aborted mission is accomplished simply by separating the capsule from the missile. This is simply cut away to show the man on the inside.

The next chart shows the general pieces taken apart—the escape system, the retrorockets, the supporting couch, the parachutes—there are two parachutes provided as is usual in the circumstances. There is also a drogue chute for slowing up the capsule in very high upper atmosphere.

This is the general nature of the final orbital mission. We launch from Cape Canavarel, the booster is the one-and-a-half-stage Atlas, discarding of this recovery device, the escape system device, engines into orbit, separation of the capsule, rotation of the capsule so that the heat shield is in front, the firing of the retrorockets which would take place somewhere between Hawaii and the west coast for landing in the Atlantic missile range area, reentry to the atmosphere after the retrorockets are discarded, the opening of the parachute, landing and recovery on water in the vicinity of the Atlantic missile range where there are many ships and recovery devices.

The capsule is so designed if it should accidentally land on land, the occupant will not be subjected to accelerations which would harm him.

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Mr. McDonough. Can he direct his landing in that case?

Dr. Dryden. There is no control over the landing point except the point of firing of the retrorockets. This is one reason you will find in the supplemental request very special types of tracking and computing facilities that are necessary to observe this maneuver, to observe the trajectory as it comes in over the United States, and predict his landing point for the benefit of the recovery groups.

Normally, probably the first time you have a full orbital flight and you go around perhaps once or twice. As you know, the path relative to the earth changes so that if he were not recovered in the first two or three orbits, you then wait 24 hours until he comes back over the same area again.

Later flights may go as long as a day, or perhaps more than 1 day.

I call your attention to the fact that this project avoids two most difficult problems that have to be solved in later space missions. In the first place, the altitude of the orbit is well below the radiation belt so that we do not have to give consideration in this vehicle to providing shielding against the great radiation belt. In the second place, the duration of the flight is short enough so that present air-conditioning facilities are quite sufficient.

The problem of feeding is not a very difficult one. So that some of the very difficult problems that have to be solved for space flight missions are avoided by this choice of the simplest mission.

As I remarked, you do not do this all the first time. Both the vehicle and the man must undergo a great deal of checking. Without going into all the details, the earliest launchings of the vehicle will be done by a cluster of four solid rockets at a rather moderate speed of 5,000 or 6,000 feet a second to check out in a short-range ballistic path the behavior of the capsule, its general stability, the forces on it, the accelerations experienced and so on.

The next step in the program, in which the Army Ballistic Missile Agency is involved, is to use Redstone boosters for somewhat higher velocities. Then we proceed up the scale so far as the preliminary flights go and use the Atlas for nonorbital paths, finally to an ICBM range, and when we have thoroughly checked out the vehicle in preliminary flights, then put it into orbit.

In the course of these tests, animals will certainly be used on some of the flights. It is quite possible that some of the qualifications of the pilot for the space mission will be made in ballistic trajectory flights.

Most of you know that we are in the process of selecting the men who will be involved in this undertaking. We began with a list of graduates of our test-pilot training schools in the services, some 120 of these. They are being interviewed, examined physically, psychologically, and all the rest of it. Within a few months we will come down to a relatively small number who will then go through a very intensive course of training, including rides in the centrifuge to which I have referred, other types of activity to get him used to the space environment, to get familiar with the inside of this capsule as the pilot is familiar with his cockpit, and to live with this project from now on.

Here are some milestones in the progress. There had, of course, been some research work done on capsules for satellite flight in wind

tunnels and otherwise in the old NACA, as well as elsewhere in the country. NASA was organized on October 1. A space task group for Project Mercury was organized on October 5. Specifications were prepared in consultation with the military and some of the contracts were mailed on October 23.

A bidder's conference was held on November 7, proposals received on the 11th. A contractor was named on January 9. There is a contract with McDonnell Aircraft Co. for 12 capsules plus a number of extra heat shields. The value, I think, is around $18 million or so.

Some have asked: Is this a sufficient number? Are you going to use them over and over again? I think it should be quite obvious to you, unless we are able to put a capsule into orbit without a man and recover it repeatedly, we certainly are not ready to put a man in it. I would like to emphasize, in addition to the technology of the capsule and the development of the associated tracking system, there is quite an undertaking in the operational sense. We are working very closely with the Navy and Air Force in developing the operational practices which will be required for recovery.

So we do expect to use them over and over again. If we don't, we certainly are not ready to put a man in them.

So far as the tests go, wind tunnel and landing system tests were started in October. This schedule moves along quite rapidly through this year. In something of the order of a couple of years we will be putting capsules into orbit. We will put a man in orbit when we know we have solved all of the technical and operational problems.

I mentioned that we are actively in research on some elemental parts of development in this activity. As contrasted with the simpler type, there is of course the winged type. You might think of the X–15 as a very first step in this type of development. We have a great deal of activity on winged configurations. The Air Force has a vehicle in whose development we are cooperating for initial use in the higher, upper atmosphere, the so-called Dyna-Soar project, which uses winged vehicles. The heating problem in this is more difficult than the heating problem in the ballistic missile.

There is an intermediate variety of lifting vehicle, which is sort of an unsymetrical type of nose cone with control tabs, which has also been the subject of a great deal of study.

From these research activities will come the followon to Project Mercury.

That concludes this presentation, Mr. Chairman.

The CHAIRMAN. Thank you very much, Doctor. Did we finish Dr. Silverstein's presentation?

Dr. SILVERSTEIN. Yes, sir.

The CHAIRMAN. We have completed Dr. Glennan's presentation?

Dr. GLENNAN. Right, sir.

The CHAIRMAN. All right, do you have anything more to add, Dr. Glennan?

Dr. GLENNAN. No, I do not, sir.

The CHAIRMAN. On behalf of the commitee, I want to thank all three of you for a very fine presentation. It gives us a basis on which we can proceed to work on the bill that is before us.

May I ask you just a few questions? Dr. Glennan, I listened to your statement very carefully. It is an excellent statement. I want to ask you about a few things in reference to it.

You refer on page 5 to $12,020,000 request for tracking equipment needed now because of the long lead times involved in the production of complicated electronic facilities.

These Minitrack stations, two in the United States, one in Newfoundland and Europe, what are they for?

Dr. GLENNAN. They are the extension of the present Minitrack network, sir, principally for the extension of that network so that we can operate in polar orbits, high inclination orbits.

Dr. GLENNAN. Is there anything else you could give us on that in open session?

Dr. DRYDEN. Yes, the Minitrack network was up until very recently the only complete operating, worldwide network on satellites, that uses a very lightweight transmitter. The antennas of the Minitrack system are fixed arrays on the ground, and all of the tracking during IGY, a great many of our satellites, has been done with this Minitrack system, which is tied into the Vanguard computing center down here on Pennsylvania Avenue.

The network as originally set up consists of a number of stations in South America and in the United States roughly along a longitudinal line, and intended to deal with satellites which are fired, say, within an angle of 30 or 40 degrees of due east.

In other words, this was a fence which would catch the satellites each time around in that path.

It is not located very well for polar orbits, and the stations referred to are those needed to provide for polar orbits and those of high inclination, which are needed in a great many of our scientific programs.

The CHAIRMAN. It is not, then, strictly for ballistic missiles?

Dr. DRYDEN. Oh, no, nothing to do with ballistic missiles. We do have a very complete briefing on the tracking system which could be given to the committee in all of its aspects.

The CHAIRMAN. You do have that?

Dr. DRYDEN. We don't have the people here this morning but we can do this if the committee wishes.

The CHAIRMAN. Later on we will perhaps call on you for that.

In reference to Project Mercury, that is the first project in which you have in mind a manned satellite. Is it intended that the satellite go around the world several times?

Dr. DRYDEN. Eventually several times. This project requires tracking facilities which are quite unique and peculiar. Our tracking presentation will tell you about the general purpose of a tracking system. This is special in this regard, that you must maintain communication with this man continuously on a real time basis—not wait for teletype reports to come in in 20 minutes. We must put a station on Bermuda, which will enable us to determine very precisely whether the capsule is going into orbit or whether it is not. The reason for this is that if it is not going into orbit, we would like to take the steps immediately to abort the mission and have the man come down in the Atlantic rather than off in the Indian Ocean or some part of the world were recovery would be a very difficult proposition.

This takes precision tracking and a rapid computing of the results. In the same way as I mentioned somewhere in the eastern United States, we will need a precision tracking station to determine as ac-

curately as we can where the landing will take place in order that we can notify and get the recovery groups into better position.

The CHAIRMAN. So you will have, really, instantaneous contact with the person?

Dr. DRYDEN. That is right. That is what we are aiming for.

The CHAIRMAN. You stated that it would probably be in the year 1965 before this would be perfected?

Dr. DRYDEN. No, I don't think so, sir. You are talking, I think, about boosters.

The CHAIRMAN. Yes, a booster that would carry men into space.

Dr. DRYDEN. The Atlas booster is sufficient to carry this capsule into space.

The CHAIRMAN. But not for the deep probes?

Dr. DRYDEN. Not for deep probes.

The CHAIRMAN. Your deep probe is 1965?

Dr. DRYDEN. To the moon and return.

The CHAIRMAN. We read in the press the other day about the possibility that Russia may have a manned space vehicle in a short time which might carry two men. Do you know anything about that?

Dr. DRYDEN. So far as I know this is based on the fact that I think we as well as other have emphasized before the committee many times that Russia has had the booster capacity to do this for quite some time. We do not have any very detailed report on the state of knowledge of recovery or details of the Russian tracking systems and so on. They do have the booster capability to do this.

Whether in fact they will, depends on whether they have been working in this direction or in some other direction. I myself think that we should be prepared for the idea that they may very well put a man into space before we do. They certainly have had the capability boosterwise.

The CHAIRMAN. That is where they have excelled in a large booster for a powerful thrust?

Dr. DRYDEN. Yes.

The CHAIRMAN. If they perfect the upper stages, they will have the ability to put one or two, maybe three men into space before we get along to that point. You say that is probable?

Dr. DRYDEN. I say we should be prepared for it. I don't think the Russians can do everything all at once. What they will do depends on what they have decided to do. We are trying to decide our program on the basis of what we think the needs to push ahead with space technology are for this country.

The CHAIRMAN. I would commend you for that. I think, too, that perhaps we have a better organized program because our program will begin with a vehicle like the X–15 which will simply go up into the space area, relatively small distance, and then immediately return to earth.

Dr. DRYDEN. That is right.

The CHAIRMAN. As we progress, we will enlarge on that—a faster vehicle, more proper thrust, and ability to go deeper into space. Isn't that your idea of the program?

Dr. DRYDEN. Yes, it is.

The CHAIRMAN. In that event, it will be not as spectacular, perhaps, but it will be nonetheless perhaps more productive of results and more assured of continuous results; is that correct?

Dr. DRYDEN. Yes.

Mr. MCDONOUGH. Will the gentleman yield for a question?

The CHAIRMAN. Mr. McDonough.

Mr. MCDONOUGH. On the X–15 flight we don't know that Russia hasn't done that. Couldn't that be done without our knowing it?

Dr. DRYDEN. I should think they would be able to do it without our knowing it, yes.

Mr. MCDONOUGH. So we don't know up to now whether they have or have not done that.

Dr. DRYDEN. We do not.

The CHAIRMAN. You mean they will throw a missile that high up without our detecting it at this time?

Dr. DRYDEN. There are parts of Russia where they can fly airplanes at a very high altitude without our detecting it.

Mr. MCDONOUGH. That is a ship. That isn't a blast.

The CHAIRMAN. I was out with the gentleman at his home district there and visited with him in California and saw the X–15. It is questionable in my mind whether it is a missile or a plane.

Dr. DRYDEN. It is in between. A winged missile.

The CHAIRMAN. It is in between. It is the last frontier of the airplane and the beginning of the spaceship. In that event, it is possible, you say, that that might get up in Russia and we might not know about it?

Dr. DRYDEN. I say Russia is a very large country. We have observers in only a few places. I should think that there are areas where they could fly an airplane very high and we wouldn't know it.

The CHAIRMAN. Let me ask about a different phase of the program, the number of employees. You say roughly you have 10,000 employees now in NASA?

Dr. GLENNAN. No, not that many, sir. It is about——

The CHAIRMAN. You will have 10,000 there in July 1960, you say. You have 8,961 now.

Dr. GLENNAN. As of February 28, Mr. Chairman, we had 8,380 on board, and we expect by the end of this fiscal year to go to 8,945. A year later, to 9,988.

The CHAIRMAN. You told the Senate committee, I believe, that you would need 2,500 or so additional employees. Did you make that statement?

Dr. DRYDEN. 1,270 is the number in the budget.

The CHAIRMAN. What is the need for the proposed 1959 fiscal year expenditures in JPL—Jet Propulsion Laboratory—facilities?

Dr. DRYDEN. May I answer that, Mr. Chairman? To go back a little bit, I think most of you know the earliest experiments on rockets in this country were by Dr. Goddard. These were on a relatively small scale and would now, I think, be called research.

The first organized attempt to develop rockets in this country was done at the Jet Propulsion Laboratory by scientists of the California Institute of Technology. So JPL is the birthplace of the practical development of rockets in this country, first for assisted takeoff of aircraft, and later in the development of missiles such as the Corporal and the Sergeant missiles.

The installations are very old. They started with small rocket stands with propellants whose potentialities were rather small com-

pared with present-day solid propellants. They have gradually carried on experiments with better propellants and in somewhat larger quantities than at present, require waivers from all the safety rules in order to operate all.

In other words, with the progress of technology, the original assembly of test stands or locations, relative to each other, are just insufficient for the safety codes. They are really operating under waivers.

The CHAIRMAN. Doctor, why didn't the Army make those improvements?

Dr. DRYDEN. The Army had these improvements in their plans for coming years. As a matter of fact, this is an item which we have picked up from their planning and we propose to let them go ahead actually with the actual work. This would have been provided by the Army in the budget for this year had JPL continued under contract with the Army.

The CHAIRMAN. So the Army does recommend it?

Dr. DRYDEN. The Army has recommended it.

The CHAIRMAN. Roy Johnson testified that in his opinion you would need $150 million more for the development of the booster in the fiscal year 1959, and that NASA would get $50 million of that.

Dr. DRYDEN. I will let Dr. Glennan answer this.

Dr. GLENNAN. I think as we have progressed in this program, Mr. Chairman, we have found it necessary to continually review the capabilities available to us and the manner in which we best should go about improving those.

In discussions, as we have at rather frequent intervals with Mr. Johnson and his people, the matter of getting ahead faster with the large booster, the clustered booster which is supporting at ABMA came up and we with them agreed this ought to be pushed as fast as they could. They, I believe, have programed additional money to ABMA for that.

In looking at the further developments which are necessary in the provision of upperstage boosters there and in getting ahead with the Vega, which we have laid on as described by Dr. Silverstein, it appeared that we might need additional funds.

Indeed, we went through a budgetary process to look at this matter. We have come up with a reprograming of our fiscal year 1959 funds now available to us in such a way as to be able to get ahead with that project very much in the way in which we talked with Mr. Johnson, but without the necessity of coming back for a second supplemental.

The CHAIRMAN. You won't need the $150 million more, then?

Dr. GLENNAN. We were not going to need the $150 million——

The CHAIRMAN. You would get $50 million out of it, but I mean the executive branch would not need the $150 million?

Dr. GLENNAN. I think that is a reasonable statement, because I think we have been able to rearrange our program so as to provide the necessary funds to get these vehicles started.

The CHAIRMAN. That is not going to cause you to slow up on that development program, is it?

Dr. GLENNAN. No, sir. As a matter of fact, I think it is going to allow us to get ahead with it faster.

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. We are glad to have you here. We have enjoyed the statements. But I have just a few questions this morning. I notice you are talking about on page 2 of the bill, in paragraph 3, subsection (a), that you want new facilities, improvements to existing facilities, and approximately 70 acres of land, $9 million.

I can see why you need the improvements to existing facilities. Why at the present time do you need 70 more acres of land?

Dr. DRYDEN. The Army made a very intensive study of the economics of this, Mr. Fulton. I don't know whether you visited the Jet Propulsion Laboratory or not. But they came to the conclusion that the cheapest thing to do was to start with an adjoining 70 acres. This may not be too clear in our presentation, but this is contiguous land to the present JPL site. To then build rocket engine test cells of adequate capability with the right separation distances and to go through a built-up installation with a bulldozer, interrupt the current work by pulling out all installations, and starting from scratch.

The Army studied this very thoroughly.

Mr. FULTON. The question is, why not use existing facilities or facilities that were already under contract? For example, the engine testing center that has been erected by private capital, or is being erected near Philipsburg, Pa. Would you check into that and see why current facilities could not be used?

Then let's move ahead a little bit.

Dr. DRYDEN. I think those are facilities for development programs. We are talking about research and development of the Jet Propulsion Laboratory, scientists on new fuels, new developments in rocket technology.

Mr. FULTON. Would you put that in the record, why existing facilities cannot be used? I would like to find if existing facilities or plants cannot be used in this program before we start constructing a whole new series of plants and extensions.

(The information requested appears on p. 76 in testimony of James Gleason.)

Mr. FULTON. Then I would like to ask you this, in the Astronautics magazine for October 1958 I read that the NASA is a leisurely extension of the NASA, it commented, and it would be moving very slowly or concertedly into space.

I look at this as a race with a possible enemy, or group of enemies, for one of the most strategic areas affecting our safety. I would then ask you on your bill whether H.R. 4990 is to put you in the race in space and put the United States first, or are we going to be permanently in a guaranteed cement-based second position all the time?

Might I just say further that Prof. G. D. Petrovich, of the Soviet Academy of Sciences, in their official magazine emphasized the historical significance of the first rocket on the moon. Are we looking at that—I am on the Foreign Affairs Committee—as the propaganda value and the fact that it puts our country also second? Is this enough for you? I want to see you are not wasting money, but I want to know that you are really putting the pressure on and not what had been guessed at in the magazine Astronautics in October 1958—

This is a leisurely pace, picking flowers along these highways and byways as we go up into space.

You must remember that while we are talking astronautics here, that is like the small boy hitting at the moon with a popgun. This isn't "starnautics." We aren't even out in "planetnautics" yet, are we?

So we are really talking big and possibly performing little.

Could you now give me what your estimate is? Will this keep us ahead of Russia, so that we leapfrog them and get some of these firsts—the first rocket on the moon, the first orbital vehicle, the first man on the moon?

Dr. GLENNAN. Mr. Fulton, I would like to answer that.

Mr. FULTON. I would like to hear a comment on it. It disturbs me.

Dr. GLENNAN. It disturbs me, too. We are operating at no leisurely pace. It takes time to add good personnel. It takes time to develop the facilities and the program, an orderly but really hardhitting program, to move forward in a field of this kind.

It takes time to develop some of the facilities. We are very fortunate to have as many facilities as we have in this country, both in industry and in the laboratories—principally the old NACA laboratories.

I think if we were to go about this program in an ordinary way simply to acquire scientific information we would be guilty of malfeasance in office. It certainly is clear to all of us that there is a great deal at stake in the international field here in the matter of the trust of these nations, vis-a-vis the Russians.

Mr. FULTON. You are moving at full speed?

Dr. GLENNAN. We are moving at a pace which I think will build up solidly toward a really all-out effort. You cannot start from a standing start at full speed, sir.

Mr. FULTON. I don't want to take too long. I didn't see in your program that you had an orbiting telescope. This would certainly tell us a lot about the corona of the sun which affects the weather in this country and radio and television transmission; and likewise we would be able to get a good glimpse of the moon.

Dr. DRYDEN. There are several groups working on the orbiting telescope, Mr. Fulton—Cripp at Harvard, Spitzer at Princeton, Goldberg at Michigan, and someone at Wisconsin. They are working out a program in this area and are under contract to us—will be very shortly under contract to us—to develop telescopes.

Mr. FULTON. I want to say to my good friend, Dr. Silverstein, that I heard you speaking of these propulsion systems. I think the chairman and I are both interested in this. Why isn't more pressure put on research and development on the solid systems?

Let me follow that with: Why don't you just go into a straight hydrogen propellant when you have the arthrite 337 with an ammonium chloride base, which gives you 77 percent per volume hydrogen?

Likewise, at Phillips Petroleum they have their ammonium nitrate base out of which they get 24-percent hydrogen per volume. Why don't you go into some of those solid propellants and emphasize those and you might do better than starting in on something new, on just straight hydrogen.

Secondly, on the propulsion systems, they all look like they are of a type that would give you extremely high rates of acceleration. My question then would be—and you can put it in the record later; I

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don't want it answered now—why don't you go into a slower and a longer rate of acceleration when you have your propulsion time? Why don't you lengthen it and not try on the second or third or fourth stages for such a high rate of acceleration?

Lastly, I wish you would put in the record what you are doing on the investigation of photon propulsion and ion propulsion systems. Then, finally, why the heck don't we get started and get Admiral Rickover in this program and say, "Go ahead and get a nuclear thing started here"? He did so well in the submarines, let's put him up in the air and get him started.

Would you agree to that? Just answer "yes" or "no" on the last question. I would like to put a real program on to get nuclear propulsion in space and then we would be a million miles ahead of the Russians, because isn't it 22,000 tons of coal for 1 pound of nuclear propulsion? Isn't that the proportion of difference? Would you answer that?

I would like Rickover or somebody to take over as they did in the rubber program and really get a pushoff. Would you agree?

(Requested information is as follows:)

Detail presentations on propulsion systems will be given during technical hearings in support of the NASA fiscal year 1960 budget.

Dr. SILVERSTEIN. I think in this program if men of the caliber of Rickover and others can be brought into the program, it undoubtedly would help. We have, however, within the program now, in the nuclear field, very able people.

Mr. FULTON. Dr. Glennan said you have to have time to train people. Heaven forbid, you already have people trained in the nuclear field. Bring them over and get them started.

Dr. SILVERSTEIN. We are working, of course, in the nuclear field with the AEC in the development of nuclear rockets. They are carrying on a part of the program that deals with the development of the nuclear reactor.

We are working with them in providing—if you will recall from my chart—the hardware that goes with the reactor to provide the source of hydrogen for the reactor.

Mr. FULTON. Give me your timetable on nuclear propulsion, when you will first have it. And then, if you will, give me the timetable for the record later, not now, on these various things that we are going to do that are strategic in comparison with Russia. When do we expect to have them? When will we have them?

I asked that before, and I wish that to be put in the record. Thank you very much. That is all.

Dr. SILVERSTEIN. As I said, we will give you a detailed presentation on propulsion.

The CHAIRMAN. There is one of your charts that shows the timetable which NASA has followed since its birth, which really impressed me with the speed you are making.

Mr. Miller.

Mr. MILLER. Dr. Glennan, I first want to express my appreciation for the statement you make on page 2 of your prepared statement relative to the NACA. I always was a great admirer of the work accomplished by the Advisory Committee on Aviation.

I think they proceeded and built solidly and well, and put us well out in front.

I don't share my very good friend—Mr. Fulton's—worries. I think that you people are quite capable and that you are doing a good job and doing it just as fast as it can be done.

I for one want to congratulate you.

Dr. GLENNAN. Thank you, sir.

Mr. MILLER. We are going through the frustrations of not having started this job soon enough.

Dr. GLENNAN. That's right, sir.

Mr. MILLER. You can't buy these things off the counter shelf in the corner grocery store. I would like to be in front of Russia. I would like to have us get a man on the moon first. But we are not going to get him there by loading too rapidly and not knowing in what direction we are going to go.

There is one thing I would like to know. We have these tracking stations all over the world. How does Russia—who apparently has no tracking stations outside of the Iron Curtain—gather her data from the things that they have put in orbit?

Dr. DRYDEN. We think they have a line of tracking stations across Russia which, as you recall, is quite a large country. So far as we know they do not have tracking stations outside of Russia.

They have advertised to the rest of the world to give them all the information that they have from some of their own firings. I don't know that they have addressed specific letters to us, but they have put notices in their journals requesting those who have made observations to forward them to Russia.

We think in some areas—in the area of the space probes, for example—it is a little difficult to get satisfactory observations without a worldwide net.

Mr. MILLER. Could it be that, without a worldwide network to follow these things—even in a country the width of Russia, which is less than a third of the globe—that maybe some of the claims they are making could be challenged because of their inability to know what their own satellites are doing?

Dr. DRYDEN. The amount of information which they have released is relatively small. Whether this is because they don't have further information or because they are not giving us all the information, I do not know. We know that it has been their practice in the IGY to wish to wait until they had a formal publication before they transmitted information.

We have found generally that when their scientists talk about scientific work—when their scientists, now; not other types of persons—they have told the truth so far as we know.

They will not, however, talk about vehicles or technology or how you get the thing up there—and really not even details of the instrumentation by which they get the information back.

So far as scientific results, when they have said that they have done something, it has usually been fairly reliable.

Mr. MILLER. Getting back to the budget, Dr. Glennan, you have an item here of $33,354,000 to provide increases under the Classified Pay Act of 1958. That is something entirely beyond your control?

Dr. GLENNAN. That's right, sir.

Mr. MILLER. We gave you that.

Dr. GLENNAN. That is right, sir.

Mr. MILLER. The Jet Propulsion Laboratory is well established. It has a going team of scientists who have worked together for a long time. I would have no objection to putting this work any other place if you can find some place to put it. I think we should decentralize that wherever we can.

But if we were to try to break down or reduce the facilities there, instead of expanding that to take full advantage of this team of scientists that work there, wouldn't it retard rather than advance this program?

Dr. GLENNAN. It would definitely retard it to separate these research facilities from the Jet Propulsion Laboratory.

Mr. MILLER. I am sorry that my colleague isn't here. I wanted him to hear that statement.

The CHAIRMAN. Will the gentleman yield?

Mr. MILLER. Yes.

The CHAIRMAN. I want to say, too, that I think tearing down any of these teams at this time impresses me as being a matter that might seriously retard the whole program. During this critical time, especially, we have got to work and use what we have available rather than attempting to destroy them.

Mr. MILLER. Wouldn't it be harder and take longer to put a team of scientists together to do this work than it would be to build facilities if they became necessary?

Dr. DRYDEN. It would take some 5 to 10 years to get a really top-notch team.

Mr. MILLER. That was the success of your old organization that you brought over into this a team of people who had worked together three or four or five places and you had them to build with.

Dr. DRYDEN. The Jet Propulsion Laboratory supplies a type of technical ability that was not present within the NACA in the field of communications electronics, and similar activities.

Mr. MILLER. About when was the Jet Propulsion Laboratory first established? It has a nebulous history.

Dr. DRYDEN. In the early forties.

Mr. MILLER. It had a sort of a nebulous history, as I understand it, where a group of men from Cal Tech got together and then eventually put this thing together. Isn't that right?

Dr. DRYDEN. That's right.

Mr. MILLER. So that it has, then, 15 or 16 years of background and experience and knowledge behind this work.

Dr. DRYDEN. And more important for this purpose, I think, is that they are the team which together with ARPA put the first U.S. satellite in orbit. They have the U.S. experience in this field.

Mr. MILLER. As we go on, we are going to need more minitracking stations around the world if we are going to bring success to this program. So this is merely a start again.

Dr. GLENNAN. That is right. We expect this program to go on perhaps at the rate of $30 to $40 million a year in the refurnishing and adding to the present facilities. This would be probably supported in the foreseeable future by both ARPA and ourselves.

Mr. MILLER. Although you say we can look forward to a billion dollars a year, we are going substantially into a program comparable to the atomic program which we started during the war and we spent

more than a billion dollars a year on that and we are just beginning to get the practical results at this time.

I have no further questions or observations.

The CHAIRMAN. Gentlemen, it is about 12 o'clock now. Do we have many more questions to ask these witnesses? If we have, we can adjourn until tomorrow morning at 10 o'clock. If we haven't, we can finish them up now so that they will not have to come back.

I think someone this morning referred to the fact we were calling their witnesses rather often and taking a lot of their time. What is the pleasure of the committee?

Mr. McDonough.

Mr. MCDONOUGH. I appreciate your appearance here and the statement you have made and the progress you are making. I think you are getting along very well. It is a difficult task to build fast when you are dealing with science.

On the X–15 flight, when will the first test flight be made? It is a little overdue, isn't it? Or is that a classified problem?

Dr. GLENNAN. No, it is not a classified matter, sir. I don't really have the most recent dates on that. I don't know.

Dr. DRYDEN. The first captive flight was scheduled last Friday, I think. I don't know whether they made it or not, to be honest with you. This was just taking it aloft. This would be followed by a glide flight, and then power flights.

Mr. MCDONOUGH. Are you directing or or just participating in this?

Dr. DRYDEN. Our people are directing them. I just have not talked with our man at Edwards Air Force Base in the last day or two.

Dr. GLENNAN. Suppose I get that information for you.

Mr. MCDONOUGH. I also observed recently as a result of the doubt about this lunik moon satellite of Russia, that in order to remove the doubt that it actually was tracked to its ultimate distance, they called on all amateur tracking stations to report to Russia. I don't know whether we have considered that at all, but that is certainly an excellent way to find out where all our amateur tracking stations are if they reply.

I don't know how extensively it was responded to, but the Russians usually took advantage of a situation here to try to get some information out of the United States. I don't know whether CIA or anyone else did anything about it. Do you know?

Dr. DRYDEN. I believe that that Agency has been on the job.

Mr. MCDONOUGH. I have no other questions.

The CHAIRMAN. Mr. Daddario.

Mr. DADDARIO. No questions.

The CHAIRMAN. Any questions, Mr. Osmers?

Mr. OSMERS. Doctor, I wanted to inquire concerning the location of your 8,000 employees. Are they scattered pretty well, or are they all here in Washington?

Dr. GLENNAN. No, sir; they are scattered pretty well. We have a large complement of employees. I can give you the exact figures.

Mr. OSMERS. I don't care for the details, necessarily.

Dr. GLENNAN. The NASA headquarters in Washington, as of February 28, had 322 on board here. At Langley, there were 3,279. At Ames out in California, there were 1,454; Lewis in Cleveland, 2,661; at Edwards, 302.

In the Washington area and ultimately to move to the Beltsville space project center, there are 249; and provided to us with the Vanguard transfer, 225; over at Wallops Island, Va., 103.

Mr. OSMERS. The reason I asked the question, Doctor: Don't you think it would be wise to disperse these as far as you can for efficiency and good administration?

Dr. GLENNAN. Yes.

Mr. OSMERS. I had the impression that a few States are getting the impact of most of this spending, which is going to run to a very sizable figure. I just wondered if that could be dispersed any more.

Dr. GLENNAN. I think, sir, that the dispersing of funds is going to take a pattern which follows parallel with the capabilities of the companies that are involved in this business. You should realize, sir, that perhaps $150 million of the $485 million which we are asking for in the 1960 budget will be so called in house expenditures; and all the rest of it will go to industry, educational institutions, and research establishments.

Mr. OSMERS. You will spend about $150 million out of the $485 million?

Mr. GLENNAN. In our own laboratories, and the balance will go to subcontractors.

Mr. OSMERS. I think it important to distribute this as widely as you can——

Dr. GLENNAN. We recognize that, sir.

Mr. OSMERS. Over the Nation, not only for the purpose of security and protection, but also to relieve some of the economic conditions which we have.

Dr. GLENNAN. We quite understand that, sir.

Mr. OSMERS. I am sure you are giving full attention to that.

Dr. GLENNAN. We are, sir.

Mr. OSMERS. You mentioned, Doctor, that your budget will probably be a billion dollars a year, shortly.

Dr. GLENNAN. I have forecast that.

Mr. OSMERS. What would you say you are spending right now, this year?

Dr. GLENNAN. We are spending $336 million; and if Congress gives us this $48 million, this will be about $385 million. Next year we have asked for $485 million in our budget request.

One doesn't know whether the progress of the State of the art will be such that we have to come back at a later date in that year. But as we go forward, some of these programs we are just beginning such as Project Mercury, such as the large booster engines, such as this family of boosters—each one of these is going to erect its own little pyramid on top of a base of space science, you see.

So I can't see any alternative but substantial levels in the course of the next 2 or 3 years. One starts out at this level, puts in a base of the things that we must carry on in acquiring new knowledge; as one gets to applications coming from that knowledge, then you begin to erect these further structures on top of that base.

It all adds up to a lot of money.

Mr. OSMERS. What would you estimate, Doctor, will be expended this fiscal year, not only by your agency but by all agencies on the so-called missile or space satellites?

Dr. GLENNAN. Missiles and space?

Mr. OSMERS. I have heard several estimates, and I just wondered what your figures would show.

Dr. GLENNAN. In the space business alone, if you can separate that out, I think you come to something slightly over $700 million. But in the missiles and space business, you come to something over $7 billion.

The CHAIRMAN. Our staff figured it out as $7.1 billion.

Mr. OSMERS. That is during the present fiscal year?

The CHAIRMAN. Yes.

Mr. OSMERS. Doctor, could you give us any idea, could you project yourself to the future just a little and see what you think we might reasonably expect to be appropriated for that before long? Seven and a half billion dollars this year; and you say yours is expanding of course all the time, and you assume the others will.

Just how far are we going to go in these expenditures?

Dr. GLENNAN. Mr. Congressman, I am not in possession of sufficient facts to give you even a sensible guess on what the missile business—the military missile business—will require. It is possible that in any of these activities, breakthroughs will occur which will allow you to look forward to some decrease in expenditures. I don't see that at the present time.

Mr. OSMERS. It looks to you like they are going to increase?

Dr. GLENNAN. I don't see how there is much chance of their decreasing.

Mr. OSMERS. Then would you say it is not unreasonable to expect an annual expenditure of from $10 to $12 billion a year?

Dr. GLENNAN. I would hesitate to go on the record as picking a figure of that sort, sir—not that I mind guessing, but it would be simply that.

Mr. OSMERS. I realize it is speculation, but you can certainly see the trend.

Dr. GLENNAN. I see no reason for believing that our defense posture is going to cost us less money in the days ahead.

Mr. OSMERS. Do you feel that you are being held back now because of lack of money and appropriations in your work?

Dr. GLENNAN. I do not, sir. I have the conviction that we are laying out our program sensibly, we are pursuing it with vigor, that we are going to need more money as the days go on; but that what we have today will allow us to get ahead with these initial steps and lay out programs that will require the additional money.

Mr. OSMERS. Mr. Fulton has been reading something which says you perhaps were proceeding in a leisurely sort of way. But I gather from your answer you certain refute that.

Dr. GLENNAN. I most certainly do. I refute the article, because he was actually quoting from an article. I don't think he himself says that.

Mr. FULTON. May I comment on the timing, that that was back in October 1958. You were sworn in on August 14 and you only took office on——

Dr. GLENNAN. The 9th, and October 1 was the day NASA went into business.

Mr. FULTON. So this was written in September for an October magazine.

Mr. OSMERS. When do you expect to have this man in orbit we are talking about?

Dr. DRYDEN. I gave a time when the capsule would be in orbit. I did not give a time when the man would be in it—simply on the ground that we would want to be sure that we had solved all of the recovery problems as well.

But within the course of a couple of years we will certainly have these capsules in orbit.

Mr. OSMERS. How long after that will a man follow?

Dr. DRYDEN. This depends on what you run into.

Mr. OSMERS. Very shortly, won't he?

Dr. DRYDEN. Very shortly, yes.

Mr. OSMERS. Thank you very much.

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. Could I explain a figure. I don't want it to appear that there is a misunderstanding on the figures. Of course in the space and missile program, that means that there is hardware in the program as well as R and D, both applied and basic research and science.

If you would separate your figure, you would have to take out the Jupiter that has just been launched as a production vehicle. If you looked at ARPA and NASA, you could probably give us a revised figure, which I think is what the gentleman from Colorado was referring to.

Dr. DRYDEN. Mr. Fulton, we paid for the Jupiter. We have to reimburse for those missiles.

Mr. FULTON. Yes, but I am trying to take out production——

The CHAIRMAN. May I say to the gentleman, the figure I gave was merely R and D. It was not hardware. It was compiled by our staff. I think it is substantially correct. It is awfully hard to do it.

You go into the Agriculture Department, for instance, and you take out what is spent there for experimental, R and D work. It is there, but it is hard to get it out sometimes. They could be wrong, but substantially that, I believe, is correct.

If there are no further questions, I want to thank you gentlemen. I think, Doctor, you are doing a good job there and you are pushing it hard.

I hope you keep on pushing it. If you need any help to push this program any faster, you let the committee know it.

Dr. GLENNAN. That we will do.

The CHAIRMAN. We are adjourned until 10 o'clock tomorrow morning.

(Thereupon, at 12:10 p.m., the committee recessed, to reconvene Tuesday morning, 10 a.m., in the caucus room, Old House Office Building, March 10, 1959.)

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., Tuesday, March 10, 1959.

The committee met at 10:05 a.m., in the caucus room, Old House Office Building, Hon. Overton Brooks, chairman, presiding.

The CHAIRMAN. The committee will come to order.

This morning, gentlemen of the committee, we had a number of other witnesses on the program, but I find that some of these witnesses

were here to testify as to the 1960 program. Of course this is a supplemental bill and not the bill for 1960, for the regular 1960 authorizations.

Therefore this morning we are going to have Mr. Frank Smith, who will make a statement to us on tracking facilities, and Dr. Abe Silverstein, of the NASA, who will make a statement on NASA facilities.

We haven't covered either one of those subjects. I suggest that first we hear them in a general statement, and following that we will recall Dr. Glennan and the other witnesses who testified yesterday and proceed with the questioning insofar as there are questions.

Mr. Smith, do you have a prepared statement this morning?

STATEMENT OF FRANCIS B. SMITH, CHIEF, TRACKING PROGRAMS, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Mr. SMITH. I do not have it written down. I have about a 20-minute statement.

The CHAIRMAN. If you will proceed with your statement. What is your title with NASA?

Mr. SMITH. I am Chief of Tracking Programs.

The CHAIRMAN. You are Chief of Tracking Programs?

Mr. SMITH. Yes, sir.

The CHAIRMAN. I think that is very important. We ought to hear from you. Will you proceed with your statement, sir?

Mr. SMITH. Thank you, Mr. Chairman and gentlemen.

The purpose of this statement is to review briefly the type of instrumentation, the type of ground facilities, that are required to support the various space flight projects. These are the tracking radars, antennas, communications systems, and so forth, that are located at various points on the earth's surface in order to track, to guide, to control, and to receive the various scientific data which are transmitted from earth satellites or space probes.

The first chart here illustrates the basic building blocks which will be a part of any global tracking network. I will use this chart to introduce the subject and then set it on the other easel and refer back to it from time to time.

The various parts of the tracking network are as follows: First of all, there must be a launching system. This is the equipment that is normally found at the guided missile ranges. It consists of guidance and tracking equipment, the purpose being to insure that the vehicle is inserted into the desired orbit, with the proper velocity, altitude, and flight direction.

Once the satellite or space vehicle has been placed into orbit, then it is necessary to track it, or to observe it periodically, in order to receive the data that are required to calculate the orbit, to measure the perturbations in the orbit, and that sort of thing.

The equipment that is used, which will be discussed in a little more detail in just a moment, can be either electronic or optical.

All U.S. satellites at least will be transmitting some sort of information back to the ground station, either scientific data concerning the space through which it is passing or possibly TV pictures of the earth underneath the satellite.

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On the ground, then, we must have tracking and receiving antennas to receive the signals transmitted from the vehicle. The amount of power transmitted here is very, very small—something much less than what would ordinarily be consumed by an ordinary flashlight bulb—so very sensitive equipment is required on the ground to receive this information.

Once the information has been picked up, both the tracking and scientific data, it is necessary then to furnish communications facilities to transmit these data back to the United States where the various computation processes are carried out.

Referring now to the other charts, I call your attention first to the optical tracking system. This is one of the Baker-Nunn cameras which are used for optical tracking. The type of picture taken by this camera is illustrated on the next chart. This is a picture of Sputnik III which was taken by one of the optical cameras. The trace here is the actual satellite. The breaks in the trace were caused by opening and closing of the camera shutter.

By reading this chart very accurately and locating the satellite against the star background, it is possible to determine its position within some 2 seconds of arc.

At present there are some 12 of these cameras which were set up during the IGY, and they are located at various spots on the earth as shown by this chart. You will note that most of them are concentrated between 35° north latitude and 35° south latitude, the reason for this being that the IGY, U.S. satellites were intended to be flown in low-inclination orbits—that is, orbits which would keep them within this region on the earth's surface.

Incidentally, on the first of several charts here, I will be reviewing existing equipment. And then toward the end——

Mr. ANFUSO. Mr. Chairman.

The CHAIRMAN. Mr. Anfuso.

Mr. ANFUSO. Can he mention those spots of the country—

Mr. SMITH. I will try to mention them. I am not sure I can pronounce them all. They are listed here: Jupiter, Fla.; Curaçao, N.W.I.; Arequipa, Peru; Villa Dolores, Argentina; Olifantsfontein, South Africa; Cadiz, Spain; Shiraz, Iran; Naini-Tal, India; Woomera, Australia; Mitaka, Japan; Haleakola, Hawaii; and White Sands, N. Mex., are the present locations.

Mr. ANFUSO. Do you have that on a small chart that you can make available to the committee?

Mr. SMITH. Yes. We can make any of these charts available to you, sir.

Mr. ANFUSO. Will you make it available, please?

Mr. SMITH. Yes, sir.

Mr. ANFUSO. Thank you, Mr. Chairman.

Mr. SMITH. With reference to the electronic type of tracking equipment, there are several methods by which tracking can be done electronically. This is one of the methods presently in use. This is a photograph of a minitrack station which is presently located at Batista Field in Cuba. This equipment operates by means of various antennas here which measure the distance, or to be more accurate, measure the difference in distances, between the various antennas and the satellite.

Mr. ANFUSO. One more question. Is that still called a Batista Field?

Mr. SMITH. I don't know, sir. It might well be Castro Field by now. Incidentally, we are planning to relocate this station to Florida and remove the equipment.

Mr. ANFUSO. I think you had better.

Mr. SMITH. These are some of the types of antennas that are used with this station.

A brief comparison between the optical and the electronic: The optical tracking stations which were just discussed furnish more accurate data than the electronic. However, they can be used only during twilight conditions, during dawn or dusk, when the sun is shining on the satellite and when the earth is in darkness. And, also, we must have perfectly clear weather, which means they are very limited. The electronic system, on the other hand, uses a very lightweight transmitter in the satellite for its operation, and it will operate under any weather conditions, day or night. So we get considerably more coverage from the electronic stations than we do from the optical stations.

Mr. KING. Mr. Chairman.

The CHAIRMAN. Mr. King.

Mr. KING. Could you explain just a little more the meaning of the word "Minitrack"?

Mr. SMITH. This is more or less a trade name, you might say, coined—I don't know exactly who coined it, but it is the term applied to this type of electronic tracking station. A more technical term would be to call this an interferometer type of tracking station.

Mr. KING. Does "Mini" mean miniature?

Mr. SMITH. It probably refers to the fact that the equipment in the vehicle is very miniature, yes. The equipment that must be carried in the satellite is very miniature equipment. It weighs something on the order of less than 2 pounds, which is an important factor, of course.

Mr. KING. This is electronic?

Mr. SMITH. Yes.

The CHAIRMAN. Proceed, sir, if you will.

Mr. SMITH. This map shows the present locations of Minitrack stations. Here again, sir, if you would like, I can read you the exact locations. You can see where they are generally on the map. One in Australia, one in South Africa, and the others are located on the eastern portion of the United States and the western coast of South America. Here again you will notice most of these are between 35° north latitude and 35° south, and also notice that this particular group of stations is in a straight line in a north-south direction.

The reason for that was that with this arrangement it is possible to get an observation or a sighting of the satellite as it comes around in low orbit once per orbit. Generally with either this type of tracking or the optical type, it is required that one get three sitings. It can be either three passes around or passes over three stations. The minimum of three will give one enough information to determine an orbit.

The orbit is continuously changing, of course— especially low altitude ones. As one gets more and more sightings, one can deter-

mine the changes in the orbit, can measure the perturbations in the orbit, and can improve the accuracy of the previous measurement.

The reference to the data-collecting equipment, the typical equipment used there is illustrated on this chart. This is a large 60-foot diameter antenna. The disk here is parabolically shaped. Its purpose is to pick up the very weak radio signals and to reflect them to the antenna which is the focal point of the system here.

This is another type antenna which is less expensive and less complicated, but also less effective. There is a model of a similar antenna here on the table. This is a model of the 85-foot diameter antenna which is presently located at Goldstone, Calif.

This equipment acts something like a spotlight in that as the satellite comes over, the antenna must constantly track and must constantly follow it in order to receive the signal from it, which means of course that one antenna could track only one satellite at a time or only one vehicle.

Most of these large antennas have been borrowed so far as existing ones are concerned. They have been borrowed from the missile ranges or from the radio astronomers. The 60-foot antenna here—there are two of them in Hawaii, there is one in California, and there are three or four others located at the Atlantic Missile Range. These have been used on a part-time or share-time basis with the missile ranges.

There is one antenna of this type presently located at Goldstone and that is the one used for tracking lunar probes.

I previously mentioned the necessity for a rather extensive communications system which would connect not just the one station illustrated on this rather simple drawing, but all the stations located at various points. They were connected to one another and back to the center in the United States. I do not intend to go into detail on this chart, but it merely illustrates the type of communications network that is required.

So far teletype lines and radio teletype have been used and have been fairly adequate. However, for many of the advanced programs which are being planned for the near future the amount of information which must be carried by the lines is more than carried by teletype lines.

So that the communications problem becomes more extreme and more facilities will be required.

Finally, the No. 5 position in our chart over here is the control center and the computing center. This is a photograph of the existing center at Vanguard. These are the teletype machines where the various information is received from the outlying station. This is a photograph of the computing machines which are used for calculating orbits and for reducing the crude data to scientific information we are looking for.

Just to complete the picture of existing facilities, there are a few Department of Defense facilities which I have not mentioned. I will do so briefly, to give you a complete national picture of what is available.

The Department of Defense is working on a tracking system which has a few stations as indicated here. The purpose of this system is to detect, and, if possible, determine the orbit of so-called dark or

silent satellites; that is, satellites that might be put up by a foreign country which would not have a transmitter which would operate with our equipment.

In connection with that, the Department of Defense has also set up a filter center near Boston which will take the output of this tracking system and attempt to keep a catalog of all the satellites which are in orbit so that if a new or unidentified vehicle is put up——

The CHAIRMAN. Explain why you have different colors for that dark system?

Mr. SMITH. The colors here merely represent different types of equipment. Actually the red and the blue are the same type. There is one network of three stations in the eastern part of the United States. There is another in the western part of the United States, and there is a receiving station in the center of the United States which picks up so-called doploc signals from the various satellites so it is a combined system.

The next several charts will illustrate the additional type of facilities that are estimated will be required for support of future space programs. If you remember, the previous facilities which we talked about in a previous discussion where I pointed out the existing Minitrack stations, I noted the stations were located generally between 35° north and 35° south latitude.

Now, when we get into higher inclination orbits, such as the 51° orbit illustrated here or the polar orbit illustrated by the blue lines on the chart, the existing tracking stations do not provide very adequate coverage. A good portion of the time the satellite will be beyond the latitudes covered by the stations.

To provide the additional coverage for earth satellites in the higher inclination orbits, NASA is proposing to establish four additional Minitrack stations located in Alaska, the northern central United States, Newfoundland, and somewhere in the European area.

Incidentally, I would like to point out that the size of the symbol here does not represent the coverage. For instance, this station would definitely provide coverage for both passes as shown here in Alaska, and the one in Newfoundland, of course, would provide immediate coverage for satellites launched northeastward from Cape Canaveral.

The second major program where additional facilities are needed would be in the tracking and the acquisition of data from space probes, lunar probes. Ideally for this, one would like to have three stations located equally spaced around the earth, about 120° part so that the space probe could be viewed 24 hours a day as the earth rotates. (This, incidentally, is a drawing of the earth looking at it from the North Pole.) Of course, one cannot get three stations exactly 120° apart, but as a practical aproach to it, we are proposing to add a station in Australia and one in South Africa which, in conjunction with the existing station in Goldstone, Calif., would furnish 24-hour-a-day coverage for space probes; at least, once the vehicle gets a few thousand miles away from the earth it would be visible 24 hours a day.

The equipment to be installed there is the 85-foot diameter antenna similar to the model we have here. This is a photograph of that same antenna.

A third major program where additional tracking facilities are required is in the manned satellite program, or the Mercury program. We have a rather severe problem here for two reasons: One being that the manned satellite, for the first few shots at least, will be in orbit for a very short time. He will only make two or possibly three passes around the earth, after which time it will be recovered.

This means that the orbit must be determined immediately or in a very short time, so that one will know exactly where to fire the retrorocket—that is, the rocket that will return the vehicle to the earth, and where one will expect to recover the vehicle.

The previous equipment, as you recall, required three complete passes over a station to determine the orbit. In this case it will be necessary to determine it from one pass.

The other factor, of course, is that we have a man aboard. Although we can put up with some degree of unreliability in the other equipment, in this case we must have almost perfect reliability.

The type of equipment that would be used there would be a tracking radar similar to the one shown here. This radar would track the vehicle as it goes overhead and would have a computer as a part of the equipment so that the orbit could be determined within a period of 2 or 3 minutes.

This final chart shows the tentative path of the manned satellite. The vehicle would be launched slightly north of east, from Cape Canaveral and would be injected or inserted into orbit in the approximate vicinity of Bermuda, after which it would make either one, or two, or possibly three complete passes. On the pass that is designed to bring him in, the retrorocket—the rocket that slows down the vehicle—would be fired in the vicinity of Hawaii or somewhere between Hawaii and the west coast.

This then would start the descent of the vehicle and it would descend over the southern part of the United States for a parachute landing and recovery in the Atlantic Ocean.

One reason for the choice of this orbit was that tracking during this descent phase will be very critical, and there are several existing radars through the southern part of the United States that we can make use of. There are radars on the west coast in connection with the Pacific missile range, the White Sands missile range, also at Eglin Air Force Base and at Canaveral, all of which will be tied into the network.

However, one of the additional facilities needed will be radar in the southern Texas area, the reason being that here there is a large gap in the tracking equipment.

This radar will try to fill that gap and provide tracking during the descent phase.

Another radar will be required in Bermuda to determine the orbit immediately after the vehicle is placed into orbit, and a third one will be required on Hawaii to determine the landing trajectory and to predict the impact point immediately after the retrorocket has been fired.

In addition, communications and data-receiving equipment, some of which is existing and some of which will have to be added, will be required in Australia and South Africa, and some shipboard equipment will also be needed in the Atlantic, Indian, and Pacific Oceans for receiving the data in those areas.

There is one other problem connected with the manned satellite, and here again the information picked up by these various stations must be transmitted by high-grade, high-reliability communication lines back to——

The CHAIRMAN. Can you speak just a little louder? I am afraid some of these members at the end, especially, can't hear.

Mr. SMITH. I am sorry.

Another severe requirement here is that a communications network will be required to transmit the data picked up from the various tracking stations back to the center of the United States or back to the control center in the United States.

That completes the presentation, sir, unless there are other questions.

The CHAIRMAN. Thank you very much, sir.

We have Dr. Silverstein. You were testifying yesterday when we concluded. We would be happy for you to proceed with what you had in mind at that time.

STATEMENT OF DR. ABE SILVERSTEIN, DIRECTOR, SPACE FLIGHT DEVELOPMENT, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Dr. SILVERSTEIN. Mr. Chairman, I would like to discuss our facility developments in our supplemental request in the amount of $24,250,000. Of this, the sum of $9 million is required for new facilities and improvements to existing facilities, and for acquiring 70 acres of land for the Jet Propulsion Laboratory which is located in Pasadena and is manned by the representatives of the California Institute of Technology.

We have an item for $12,050,000 in support of the new tracking facilities that have been described here by Mr. Smith. Another item of $3,200,000 is for propulsion development facilities to be used in the testing of the million to a million and a half pound thrust rocket that I discussed in my presentation yesterday.

There was a brief discussion yesterday by Dr. Dryden regarding our first item of $9 million, in which he mentioned the fact that the Jet Propulsion Laboratory is the oldest laboratory engaged in solid rocket development and in some of the early phases of liquid rocket development in this country.

This team is a very fine team of men who have been working together for some 15 years, who have been brought into the NASA fold because they add to our complement of people with experience in the satellite and space probe field.

This group formed a part of the group who put up the first U.S. satellite, the Explorer I. They have great capability in the field of solid rockets in which they pioneered, and in the fields of electronics and communications. These are talents that were not developed in the NACA organization. Rather, the emphasis there was on basic areodynamics and propulsion.

The funds requested here include the relocation of some of the thrust stands, for both solid and liquid rockets, to the new site of some 60 acres located behind the current laboratory site. This relocation is required in order to provide the right degree of safety for the new

propellents and the new sizes of rockets that are being studied in support of the space program.

Also, the funds provide for the modification of existing buildings that are currently too small and too limited in their equipment and facilities to properly support the space program.

A few new structures are also needed in support of this program. The breakdown for the items is as follows:

For land acquisition, $375,000.

For utilities in support of the facilities, $2,950,200.

For relocation of test facilities, $1,931,800.

For modernization of existing supporting facilities, $2,255,000.

And for new supporting facilities, including a vehicle assembly building and a reports and periodicals building, a total of $1,488,000—totaling the $9 million requested in the supplemental.

Moving along, in support of the tracking facilities, we request $12,050,000, including facilities required in the electronic Minitrack network. As Mr. Smith described, these stations are to provide tracking for the high inclination shots, those that are aimed between 51° and 60° inclination, and also for the firings we will make in a north-south direction across the poles. Our current network is aimed at the lower inclination orbits supporting the IGY program in which all of the satellites have been fired in low inclination orbits.

We also have an item for large antennas comparable, and in fact somewhat identical, to the one shown on the table. There are two of these to be added, one in South Africa and one in Australia.

In addition to the basic foundations required for these antennas, the antennas themselves, and the electronic gear that goes with them, we must also provide funds to establish communications with the center to which data is brought from the antennas and where it is computed.

The third major item in the tracking area, also described by Mr. Smith, is for long leadtime items in this tracking network which are necessary in support of the manned space vehicles for which we are providing in this supplemental.

We require support for the radar-type equipment which has a leadtime of over a year to procure. It is intended to place one of these radar systems at about Bermuda, another in Hawaii, and another one in the southern part of the United States.

The sums of money involved are $3,300,000 in support of the electronic tracking stations, $3,500,000 in support of the deep space probe tracking network, and $5,250,000 in support of the manned space tracking systems, adding to a total of $12,050,000.

Another major item of facilities that we are presenting involves the propulsion development facilities for the large rocket engine, the million to a million and a half pound rocket. As you know, in the development of one of these large rockets, the test stands and the supporting equipment for the test stands are of a very much larger size than we have had to have in the past.

The largest rocket engine that has thus far been developed in our whole propulsion development program of liquid rocket engines is in the order of 150,000 pounds.

In going to a million and a half pounds, as you can see, we are going up some 10 times in size. We must build up our facilities to meet this requirement.

We have been working closely with the Air Force in the handling of these facilities. We have received agreement from the Air Force authorizing us to utilize their special machine shop equipment and all of their facilities at Edwards Air Force Base that can support us. They currently have a request for a stand in which we may be able to test and are planning on testing our large rocket.

There need to be additions, however, to the stand that are particularly directed toward the test of this particular engine as contrasted with other large engines that can be tested on the stand.

Specifically, the breakdown of the funds required in the propulsion area is as follows: For gas generator and control facilities to be located at Santa Susanna, $471,000; for turbopump test facilities, $563,000. Both of these facilities are in support of the components of the engine that are used to feed the liquid propellants to the engine. Again, because of the great increase in size of this rocket engine, whole new types of pumps must be developed to feed the fuel from the tanks to the engine, requiring development work and the equipment to support the development work.

Also, there needs to be some increase in the laboratory and manufacturing equipment at the Rocketdyne plant at Canoga Park in the amount of $366,000, totaling $1,400,000 to be spent at the contractor's site.

In addition, in support of the work at Edwards Air Force Base, particularly directed toward the development of this engine, we have for stand 2–A at Edwards, $219,300; for stand 1–A, $944,500; and for stand 1–B, $636,200, for a total of $1,800,000 at Edwards Air Force Base.

The total of these two numbers is then our requirement of $3,200,000.

The CHAIRMAN. Is that all you are going to spend at Edwards, $1,800,000?

Dr. SILVERSTEIN. This is the total in the supplemental to be spent at Edwards. That completes my presentation.

The CHAIRMAN. May I ask you a question or two. What does an antenna, like the one you have a model of there on the table, cost?

Dr. SILVERSTEIN. May I refer that to Mr. Smith?

Mr. SMITH. Mr. Chairman, the basic antenna there would probably cost in the neighborhood of $1 million to $1½ million. By the time the installation is completed with all the control mechanism, the receiving equipment and so forth that must go with it, it will run in the neighborhood of $3 million to $4 million.

The CHAIRMAN. Rather expensive items, aren't they?

Mr. SMITH. Yes, indeed.

The CHAIRMAN. Will you have any hope of getting the cost of those antennas down a good deal, in the future?

Mr. SMITH. I doubt that they would come down appreciably, sir. One factor here is that this is a development program that is constantly changing, and a lot of new equipment will be added to them as additional ones are necessary.

So the cost is not likely to come down, I don't believe, sir.

The CHAIRMAN. Where is the 70 acres you are purchasing for Cal Tech?

Dr. SILVERSTEIN. It is contiguous with the current plot and just behind the plot—60 of the acres are. And the other seven-and-a-fraction acres are at one corner of the plot.

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The CHAIRMAN. Where is that located?

Dr. SILVERSTEIN. Pasadena, Calif.

The CHAIRMAN. Any questions? Mr. Fulton?

Mr. FULTON. On the antenna you are speaking of, my question first would be: How could you use existing facilities? For example, at the University of Manchester, or possibly Cambridge University, my interest there is in radio telescopes. Would it be possible to use any existing facilities instead of building three more new facilities such as you speak of?

Dr. SILVERSTEIN. Mr. Fulton, we have been attempting to use the Jodrell Bank, Manchester, antenna. The fact is, however, that this antenna is, and was originally, constructed for the purpose of radio astronomy. Our program, the way it is shaping up, will involve having a number of bodies in the sky.

For example, in our firings toward Venus or toward Mars, these flights will last a very long time. For example, a Venus firing will involve some 150 days. A Mars firing, 235 days.

Mr. FULTON. I thought that was the type of flight in the deep space you would use the Jodrell Bank while for the high horizon you would not be able to use it for something such as the man in space.

Dr. SILVERSTEIN. Sir, we would try to use it, except I have a feeling that Dr. Lowell might object to our continuous use of this antenna which would prevent him and his group from doing work in radio astronomy. I think in our discussions with him he has been very, very generous in allowing us use of the time of the antenna and has attempted to be cooperative.

I have a feeling that if we should press it for as long as we would need this antenna, over a period of time he might become less generous and in fact he has indicated he would like to reserve some time for his own uses.

Mr. FULTON. Of course he is having budgetary problems with Parliament of Britain at the present time. I thought that maybe while they are having those budgetary problems, we could discuss with them the use on the deep-space probes or on the man-in-space probe of the radio telescope at Jodrell Bank.

Dr. SILVERSTEIN. We are currently supporting his effort there. Over a long-term pull, however, I don't think it will be practical to withdraw this telescope from the work which he and his group who are experts in the use of the radio telescope are doing, and to devote it principally to the space-tracking field. I don't think it would be fair to his group and I am sure he wouldn't agree to it.

Mr. FULTON. I don't want to see his installation go either partly unused or get into financial difficulties so that the research in the West is hampered. I am interested in seeing that we can use up any extra time that there might be on that scope. Are you doing that?

Dr. SILVERSTEIN. Yes, sir. I think you might recall that he was tracking on our latest moon probe.

Mr. FULTON. I do recall that, and I appreciate your cooperation in working with him. I simply want to see that all the installations that we might have in the West are used.

Secondly, that we do not go into new installations if the other ones will be satisfactory. At what level would he pick up on our horizon the man in space?

Dr. SILVERSTEIN. His installation will not be used in the man-in-space project at all.

Mr. FULTON. The horizon would be too high?

Dr. SILVERSTEIN. That's right.

Mr. FULTON. Let's ask something else. In the use of current facilities I have no interest whatever in the Chrysler Corp., but I do know that they have gotten the State of Pennsylvania to make available to them, near Philipsburg, Pa., quite a bit of mountain territory, at little or no cost, for jet engine testing stands.

Have you checked to see whether we could not use installations already in existence, simply using that as an example, before we go into a great expansion at any particular location? There are other jet testing engine stands. I am not referring to Pennsylvania alone.

I am speaking of one that I know specifically. Have you checked with Chrysler Corp. at Philipsburg to see if it is possible to use the current stands or the setup now coming into operation?

Dr. SILVERSTEIN. We have attempted to use, for example, the Edwards installation which is the major large Government installation for the testing of rocket engines. As you can see, this is an effort in that direction.

Mr. FULTON. There has been some criticism on this side of the committee of concentrating too much of this program in one place, while there are many areas in the country that would be equally available for it. And second, because of, really, the changes in economy that is coming in this country as well as the social structure, this program should be spread around the country as much as possible.

The third reason is for security purposes. In fact, I am a little bit questioning the wisdom of placing the heads of all these agencies in Washington, and we are looking ahead to the fact that just here in Washington, or nearby in Maryland or Virginia, there will likewise be the head of the space agency as well as the Pentagon down here. You get 1 million TNT megaton bomb around this area, and you certainly would pass out a good deal of the brains of this country in leadership as well as administration. So I am not speaking that it should be in Pittsburgh, Pa., but I am certainly bringing up the point that we should have it justified when we put all these things down through certain channels that we should find that there is broad enough coverage that we get a good widespread program.

I do think we have concentration, but I think that this committee ought to be pretty careful about what they recommend in the way of individual companies and individual articles and individual sites. I don't think we want to get in any trouble recommending articles which are technical in nature, which may give us trouble later on. I personally don't intend to recommend any companies, or any articles. I want the record to show it.

Mr. FULTON. I have had a complaint—not with the NASA, but on certain installations—that there was not proper bidding opportunity. One of those companies specifically had complained bitterly about the fact that their own type of equipment was used, and they had no opportunity to bid.

So I feel in all justice, if anybody sees such an injustice like that on this committee, they should speak up, whether it is his city or not. When it comes to my attention, you can count on it, Mr. Chairman, I will speak up in every case.

But I want no favoritism for any one of the companies. I would like to broaden this so that many, many companies in any country can bid on this Goldstone-type antenna.

I will go no further.

Dr. SILVERSTEIN. Mr. Chairman, I will make one statement here. It is our custom to take competitive bids on the equipment which we purchase. For example, in our Mercury capsule that Dr. Dryden described yesterday, we had 13 different companies who presented bids to us on it. In general we take bids.

In some cases where there is a particular item that is peculiar to the talents or abilities of a given company, and cannot be produced by any other company in the time required, we are forced, of course, to do business with this company.

The CHAIRMAN. Tell me this: What laws do you proceed under when you ask for bids?

Dr. SILVERSTEIN. We use the Armed Forces Procurement Act.

The CHAIRMAN. Armed Forces Procurement Act?

I would suggest this, that our counsel look over the Armed Forces Procurement Act. I helped write it on the Armed Forces Committee, but we ought to study it and see whether or not it does apply properly to this type of endeavor.

In that respect, we would like to have the cooperation of the counsel from NASA to see whether or not any changes should be effected in the Armed Forces Procurement Act which would facilitate this type of work, and yet be fair to Pittsburgh, Pa., and all sections of the United States and also all industries.

Mr. FULTON. I agree with the chairman thoroughly. I think that is a good idea.

The CHAIRMAN. Do you use competitive bidding as a rule?

Dr. SILVERSTEIN. We use competitive bidding as a rule.

The CHAIRMAN. Of course under the Armed Forces Procurement Act you can avoid competitive bidding and have negotiated bidding.

Mr. ULMER. Mr. Chairman, it has been our practice even in those cases where competitive bidding is not practical to use competitive negotiation. Negotiation is used primarily in cases where it is difficult to specify in detail what you are trying to buy, where you can't draw detailed plans and prepare detailed specifications.

Many times the technology is far in advance of what you can put down in words. But in those cases, rather than negotiate with an individual company, we conduct what we call competitive negotiations where many competent firms throughout the country are called in and asked to present proposals, and then we choose the proposal best suited to the needs of the Government.

The CHAIRMAN. I can see in this type work, which is research and development, that there will be a greater demand for noncompetitive types of bids than there would be in any other agency of Government perhaps. I can see, therefore, your agency is going to have to be very, very careful in assuring itself that the public is properly given the opportunities to negotiate and that there is no favoritism practiced in handling your negotiations.

Thank you for yielding.

Mr. FULTON. I am glad to yield. I believe that you are doing a good job in NASA. I want that in the record. But I do recall that previous to NASA, in the missile program over 50 percent of the

amount in value of contracts in the missile field were concentrated in one State of the United States.

So I would like you to look into the program to see that there is a fair distribution among the States of the United States, and if you will put into the record the division by States or areas, whichever you would like, of the spreading around of whatever the contracts and authorizations are that you are handling.

Dr. SILVERSTEIN. We will furnish you this information.

(The information requested appears on p. 74 in testimony of James Gleason.)

Mr. FULTON. May I finish with one other thing? In the research into the missile, rocket, and satellite field, of course there comes up the question of mobility. Likewise, the question of security and concealment of the launching pads.

I would like you to report first in the record later on what is being done to try to develop a program of putting the launching of missiles underground, rather than having them stand up in such an exposed position—both to the elements, wind, tornadoes, as well as possible enemy action.

For example, when I have been to Canaveral a number of times, I could see that one enemy bomb would wipe out the most of Canaveral.

With the delicate instrumentation that there is with these missiles standing on their backsides with nothing more than their own structural support—a little assistance from the stands—a bomb, while it might not destroy them, would certainly upset anything in the way of a return that we could make as a retaliation.

Dr. SILVERSTEIN. This is an area completely under the jurisdiction of the Department of Defense, and any information necessary to answer the question would be best obtained from officials of that Department.

Mr. FULTON. The second thing is this: When I was at Redstone Arsenal and saw the Jupiter-C demonstration with other members of this committee, it struck me that there was a peculiar lack of mobility for the Jupiter-C rockets that are now going into production.

For example, I understand there is a 15-minute countdown to erect one of those rockets by pulling it up with a line attached up near its nose. I might say to you that that is the same way the Pennsylvania-Dutch farmers for centuries have pulled up their barn structures. And possibly the research and development on that has stopped at the point where the Pennsylvania-Dutch farmers stopped 300 years ago when they settled in Pennsylvania.

In the oil industry and other industries they have stressed mobility in inaccessible areas where there are no roads, erecting steel structures 100, 110, 120 feet high, that must bear very heavy winds. They put them up, I understand, in 3 to 5 minutes. They have them on carriages that can be moved well.

I wish you would institute a program of mobility to check in other industries that are around this country the best method of packaging, the best method of carriage, the best method of erection, and possibly the best method of transferring, even at these Nike sites.

I feel that the explosions there have been—and the failure at certain Nike sites have been because there has not been adequate scientific attention paid to the handling of these ordinary Nikes by

servicemen. Because they are in part space, I wish you would check to see why they are taken by hand and put onto cars and wheeled up and lifted off again and put into place ahead of time.

Thank you.

The CHAIRMAN. Mr. Anfuso.

Mr. ANFUSO. No questions.

The CHAIRMAN. Any questions, Mr. Quigley?

Mr. QUIGLEY. May I ask a question. I don't know whether it is particularly germane to the discussion here today. I had the pleasure of seeing "Face the Nation" on Sunday, Doctor. Without getting into the question of whether it would be proper to determine when to take a shot at Venus, a deep-space probe or whatever it might be, the thing that bothers me and the question I would like answered is this: It seemed to me that whatever value or knowledge there is to be gained from a deep-probe shot, whether it is in June or whenever it comes off, is going to be limited by the life of our radios.

Query: Can we anticipate that the record which was recently set by the radio in the shot past the moon will be exceeded in the incident we will fire in the general direction of Venus?

Dr. SILVERSTEIN. Yes, sir. This in fact is one of the points why, you recall, I was a bit hesitant about picking a time. In our later shots, of course, we are developing the technology of maintaining the power supply for a great deal longer period than we have done in the past.

For example, our newer shots will have aboard solar cells which should maintain power all the way out for many, many days; in fact indefinitely. We have currently, for example, the Vanguard I satellite which has a small solar-cell installation that is still in use. We are putting these in our later program—in fact, the program scheduled for the middle of the year.

Of course, one of the things that worries us is whether or not this technology is moving along fast enough. It is a new piece of technology developed to provide power in the order of watts for transmitters instead of the milliwatts that we are using currently.

For example, in the moon shot we used 180 milliwatts of power for transmission. In our later shots we may use as much as 10 watts. There is a ratio here of some 60 to 1.

This requires major technological developments.

Mr. QUIGLEY. The thought would be that by the time the deep space probe is launched, you will be satisfied there will be a reasonable life expectancy of much greater duration than we are currently enjoying as far as our radios and our vacuums are concerned?

Dr. SILVERSTEIN. Very much so, yes.

Mr. QUIGLEY. Doctor, could I raise one other point: It was suggested by the question of Mr. Fulton regarding underground launching. Because of my membership on this particular committee, an interested constituent submitted to me a rather detailed plan for underground launching of missiles or satellites or the like.

Frankly I lack the scientific knowledge to pass judgment on it.

Would it be possible for me to submit this proposal to you or someone in your organization to determine whether it is feasible, practicable, a good idea, or ridiculously expensive?

Dr. SILVERSTEIN. You may submit it. I think it would be more appropriate to submit it perhaps to some areas in the Defense Department where the studies of this subject are going on very intensively. I can recommend to you the proper place.

Mr. QUIGLEY. I appreciate it if you would, because I have not as yet given an intelligent response, simply because it was not in position to formulate an answer.

That is all.

The CHAIRMAN. Any further questions?

Mr. HALL. Mr. Chairman, may I ask one, please?

Doctor, I was wondering yesterday, and perhaps someone did ask and you possibly gave the answer: In the event of an all-out attack, are the missiles in preparation by NASA and for example ARPA also, are they immediately then made available to the Defense Department? Is there an arrangement, an agreement, whereby they would not have to go through a lot of red tape to make use of those immediate facilities if they wanted to launch, for example, warheads?

Dr. SILVERSTEIN. I am sure that would be the case because currently all of our basic boosters are going through the same production lines that the missiles go through. It would be a simple matter of diverting.

Mr. HALL. They would be available to you?

Dr. SILVERSTEIN. Certainly.

The CHAIRMAN. Let me ask you this—if you have finished—you are not handling that million and a half pound booster. That is being handled by ARPA?

Dr. SILVERSTEIN. We are not handling the clustered booster of the million and a half pounds. That is an ARPA program.

The CHAIRMAN. You are handling the million pounds?

Dr. SILVERSTEIN. We are handling the million-pound thrust single-chamber rocket engine.

The CHAIRMAN. There has been no change in the status of that program since we had the general hearings several weeks ago, has there?

Dr. SILVERSTEIN. Not to my knowledge.

The CHAIRMAN. Are you still pushing that program?

Dr. SILVERSTEIN. Very much so. I think that is a very important program, and, as you could tell by my discussion yesterday, we consider it to be a very important member of our family of boosters.

The CHAIRMAN. I want to ask you a few questions in reference to the bill. In the first place, this $3,354,000: Is that the salary increase that we granted last year?

Mr. ULMER. That is correct, Mr. Chairman. It is entirely for the Classified Pay Act costs.

The CHAIRMAN. And this is the 10 percent increase we granted last year?

Mr. ULMER. That is correct, sir.

The CHAIRMAN. For additional research and development, $20,750,000. I think you covered that pretty well, Doctor, in your statement, didn't you?

Dr. SILVERSTEIN. Dr. Dryden, I think, mentioned that yesterday in his presentation of the man in space flight. It will all be used in that program.

The CHAIRMAN. It is all in the man in space flight program. I want to ask you; here, of course, you have covered this subsection for additional construction, subsection (e) page 2. You covered that carefully. On line 3 on page 2, $9 million—that is JPL at Pasadena, and you have covered that. The various striking locations, you have covered that.

But now when you get down here to (b) on page 2, what do you mean here in reference to this language: "Authorization is hereby granted whereby either the amounts prescribed in subsection (a) or the amount prescribed in subsection (b) of subsection (a) (3) may, in the discretion of the Administrator of the National Aeronautics and Space Administration, be varied upward 5 percent to meet unusual cost variations, but the total cost of all the work authorized under such subsections shall not exceed a total of $24,250,000."

I am familiar with the history of that particular provision in the armed service legislation, the construction bill which we had for many years. But why do you need that in this bill?

Mr. ULMER. Mr. Chairman, as you know, this is standard language in authorization bills of this type.

The CHAIRMAN. We haven't had enough of these types of authorization bills to say what is standard, and what isn't standard. I believe this is the first supplemental appropriation bill for NASA that we have ever had.

Mr. ULMER. I beg your pardon. I wasn't clear on that. I meant to say the identical provision had been carried in NACA authorization bills prior to the establishment of the NASA. The bill carries two items and the amounts are specified, $9 million and $15,250,000. If in the course of entering into the contracts for this work we find that bid variations may require one item to go up a little, we would like the flexibility of dropping the other item a corresponding amount.

So that the sum total of both items are still within the $24 million. The provision will provide some flexibility in the contracting procedures.

The CHAIRMAN. As I understand it, this will give flexibility, but in no instance will the total cost exceed $24,250,000?

Mr. ULMER. That is correct.

The CHAIRMAN. Without that provision, what would your figure be on line 16, page 2?

Mr. ULMER. It would be the sum of the two items but we would have no flexibility.

The CHAIRMAN. The same as about here?

Mr. ULMER. Yes, sir.

The CHAIRMAN. This merely permits you to vary within the authorized amount, up or down, within 5 percent?

Mr. ULMER. Yes, sir.

The CHAIRMAN. On section 2: "Any amount not to exceed $500,000 of funds appropriated pursuant to the authorization of subsection (a) (3) for the first section of construction facilities made with the approval of the Bureau of the Budget to be used for construction of new facilities," did you cover the type of facilities there that you expect to use that $500,000 for?

Mr. ULMER. We have not spoken of that, Mr. Chairman.

The CHAIRMAN. Will you speak of it now?

Mr. ULMER. I would be very glad to, sir. This item was first carried in the NACA construction authorization bill, Public Law 85–617, section 4. The identical language is included there. This is a provision to allow primarily for the construction of a new type of research facility that may come up during the course of the year when Congress is not in session.

We have used it once, I believe, under our current NACA authorization. If some very urgent piece of work, some very new research idea, comes into being during the course of the year, this would provide some flexibility where that item could be constructed without a special authorization.

The CHAIRMAN. Would this authorize you to buy new land and establish new bases or laboratories?

Mr. ULMER. No, sir. The provision does not include the authorization of land. It is primarily to—at our existing sites—construct some new type of research apparatus that we do not have authority for.

As you notice, however, the amount must be absorbed within our existing funds.

The CHAIRMAN. You have general authorization to acquire land, though, don't you?

Mr. ULMER. No, sir; we have no general authorization to acquire land; a specific authorization bill is required.

The CHAIRMAN. You do not have authorization to acquire land?

Mr. ULMER. Not unless it is specifically authorized.

Mr. FULTON. Could we ask Dr. Silverstein to identify with the title, the witness, if he is going to testify for you? Would you give us your title and background?

Mr. ULMER. My name is Ralph Ulmer, Mr. Fulton. I am budget officer of the NASA. I am sorry I did not identify myself.

The CHAIRMAN. He is the key man.

My counsel has just called to my attention stipulations about practice that are placed in the armed services construction bill which require the constructing agency to notify the committees of the House and Senate in the event it is necessary to use this particular emergency authority.

Mr. ULMER. This would most certainly be our practice, sir. We have followed it in all reprogramings that we have done with existing——

The CHAIRMAN. Do you have any objection to that?

Mr. ULMER. None whatsoever. We would expect to do that.

The CHAIRMAN. We could use the same language. How would that read?

Mr. DUCANDER. In this case it was the Air Force: "The Secretary of the Air Force or his designee shall notify the Committees on Armed Services in the Senate and House of Representatives immediately upon reaching a final decision to implement the cost of construction of any public work undertaken under this section, including those real estate actions pertaining thereto." This happens to be for this particular bill.

Mr. ULMER. We would have no objection to that provision in our bill, sir.

The CHAIRMAN. If you will draft the suitable language, it could almost track that same language, we will offer it then as an amendment at the proper place when we take up reading the bill.

Mr. Fulton?

Mr. FULTON. Should there likewise be a notification to the Appropriations Committee of both bodies?

I would like to ask our counsel, or is that sufficient?

Mr. DUCANDER. As a general rule, we don't take that up for the Appropriations Committee. We have in the past always just done it for the authorizing committee.

The CHAIRMAN. I might say to the gentleman from Pennsylvania, the Appropriations Committee has powers within itself by which they can protect themselves. They can acquaint themselves with what is going on.

Mr. FULTON. I would like to ask Dr. Silverstein a question——

Mr. DADDARIO. Mr. Chairman, is it possible we could get some kind of an idea as to what these buildings look like? Are there any plans or anything of that type available?

The CHAIRMAN. I don't think there would be any particular advantage in taking the committee's entire time to do it unless we have arcihtects on the committee that really want to go into it. I think there is no objection to it at all.

Mr. DADDARIO. The only reason I inquire is because of the fact there is $9 million to be spent. I would just like to have some kind of an idea as to the type of building, so that I would know what the $9 million is being spent for, rather than just a general, overall observation of this kind.

The CHAIRMAN. Could you tell us something about the building?

Mr. ULMER. Mr. Daddario, in the justification booklets that were submitted to the committee, the buildings that are proposed for construction under this authorization are itemized. In the case of the JPL facility, there is a plot plan shown in which all of the new facilities proposed for construction are identified.

It is a rather complete breakdown.

Mr. DADDARIO. Could that be made available?

Mr. ULMER. Yes, sir; it has been made available to your committee staff, sir.

Mr. DUCANDER. I have, Mr. Daddario, these books down in the committee. I had intended to bring them up tomorrow morning when we marked off the bill. We will go through it section by section, you see, and I will have that material available and before each Member. We hadn't anticipated we would get to this markup of the bill this morning. That is why I didn't bring them up.

Mr. DADDARIO. I inquired because of the fact that I did not know we would have that information. That answers my question.

The CHAIRMAN. I recognize Mr. Fulton.

Mr. FULTON. The question comes up on page 2 of the bill, line 3, where there is a tying down of the location on line 3 to the Jet Propulsion Laboratory, Pasadena, Calif. In view of the questioning this morning, would it interfere with your plans if you were given the opportunity to look nationwide and see, as to existing facilities as well as other facilities, where there might be developments added, by my making an amendment on line 3, striking the words "Laboratory, Pasadena, Calif."?

Would that interefere with your program? I give you broad discretion, but I would like you to make a survey and see if Pasadena is the place, or I want to know whether you have looked into other facilities.

The CHAIRMAN. Doctor, did you want to make a statement on that point?

Dr. GLENNAN. Yes; if I may.

Mr. FULTON. I might say to you just as a general thing, I would rather not tie you down by location until we are sure that that is the location that is the best suited in the country. I think it is much better to give you broader discretion.

Dr. GLENNAN. With respect, Mr. Fulton, to that particular item, these are research and development facilities which are in use practically daily by the engineers, scientists, located at the Jet Propulsion Laboratory.

Mr. FULTON. I understand that.

Dr. GLENNAN. This is their backyard, in effect, and it is an extension, in the vernacular, of a machine shop.

Mr. FULTON. But it is a jet engine stand testing development.

Dr. GLENNAN. No, these are rocket engine stands, sir, not jet engines.

Dr. DRYDEN. You mentioned Pennsylvania, which I believe is a jet engine testing facility—at least the one I am familiar with is.

Mr. FULTON. The point is this: Are we always simply going to develop just where there are current facilities of the same type, or would we move into some jet testing engine facilities, or other facilities, and move it around the country?

One of the problems in this program is: Shall space just be developed through former aeroplane companies that have dealt with the National Advisory Committee for Aeronautics? My answer to that is "No," they should have their substantial share, but we should get a broad coverage of all the States. That is why I have asked to have put in the record at the beginning of NASA on October 31, from there on, I would like a list of the contracts by States to see that we are getting that broad coverage.

Dr. DRYDEN. These are laboratory-type facilities. They are not big engine test stands or the development facilities that are used in the practical development of engines. This is for research on fuels, on problems of cooling of rocket engines, and so on.

Mr. FULTON. Can you describe the difference, then, Doctor, between a jet engine testing stand as to physical facilities, and a rocket engine testing stand as to physical facilities?

Why can one not be used for the other, if you do the proper modifications? What is the real reason that there has to be a wall built between the jet engine testing stand facilities and the rocket engine testing stand facilities?

I don't get the difference.

Dr. DRYDEN. They are completely different. I think the only way is to show you pictures or to look at them.

A jet engine facility is a jet engine mounted on a frame, usually in a large tank with a lot of air compressor equipment and evacuation equipment.

A rocket test stand is a device sitting out in the open, instrumented. It is an entirely different animal. It is like the difference between a lathe and a milling machine.

Mr. FULTON. Yes, but we saw one of the Jupiter-C's down at Redstone Arsenal, and it seemed to me that that kind of a pad could

be put almost in any State. Can you describe the particular State to me of the Union that that kind of a stand couldn't be put in?

Dr. DRYDEN. A laboratory can be built in any State if there is need for it. You need not only the laboratory, but the people to go with it who are experienced in this art. If you take a new group who have not worked with rockets, it will take a minimum of 5 to 10 years before you have a team who are able to do research on rockets.

If you want to do a development test, you can train technicians in much shorter time to just run engines to see that they run.

Mr. FULTON. Then why are all the advertisements appearing in all the New York papers and all over the country luring engineers out from all over the country to expand these present facilities and taking them away from the cities that have developed them, and now they are being offered all these great salaries—you are saying that it can only be done where they are now. I doubt that.

Dr. DRYDEN. I say if we are going to do this in a short time at a reasonable cost, we should not destroy the Jet Propulsion Laboratory by refusing to give them the facilities they need to do the work, by starting a new group somewhere else. We want to use all existing groups who are competent, no matter what State they are in or where they are.

Mr. FULTON. They all happen to be mostly in one State.

Dr. DRYDEN. I do not think they are, sir.

Mr. OSMERS. Mr. Chairman, will the gentleman yield?

The CHAIRMAN. Mr. Osmers.

Mr. OSMERS. Don't you feel, Doctor, that we are getting almost a dangerous overconcentration of these facilities in southern California?

Dr. DRYDEN. We have laboratories in Ohio, Langley Field, Va. We have contract work going on—I can't name all the States—Missouri, Alabama, Tennessee to some extent, I believe. We can give you this list. I think you will find that the work is scattered widely in the United States. Tracking stations you have seen all over the country, and even around the world.

Mr. OSMERS. I certainly know, Doctor, that you can submit, and I am aware of the fact that there are a number of installations concerned with this development that are not located in southern California.

I have no ill will toward southern California. But those of us that represent highly industrialized States where the Government has already expended millions of dollars to create facilities, sometimes wonder at this great concentration for two or three reasons.

First, from a defense standpoint, I think there are some considerations that must be weighed against concentration.

Secondly, from the overall picture of the economy, it seems to me that the wider distribution of these facilities is in the public interest. I have in mind at the moment the concentration of the automobile industry in the State of Michigan.

When automation takes place, when there is a little dropoff in the sale of cars, you have abnormally high unemployment in that area. I was so impressed last fall in visiting southern California by this concentration, and what would happen if Congress should fail to continue these very high, increasing appropriations in this field, what would happen to that economy out there is something very awful to think about.

So it is not maybe all in the interests of southern California.

Dr. DRYDEN. I agree with you in principle completely. We have a very difficult job to do, as you know. I think we intend to make use of facilities wherever they are throughout the United States.

I do not think we can make our decision solely on the basis of putting it in some particular locality. I think we should give that every consideration and do this when it is possible to do so.

The CHAIRMAN. If you are going to make any changes, Doctor, too, bear in mind that the distribution facilities should——

Mr. FULTON. Louisiana?

The CHAIRMAN. If there is going to be any grabbing, of course we are going to grab for the State of Louisiana. Pittsburgh won't be alone in that.

But bear in mind also there is too much concentration on the coast, too, the coastal areas of the country.

Dr. DRYDEN. We had a very interesting visit from the Governor of Michigan going over the resources of that State and the human resources, the skills, the physical resources—a very interesting presentation.

Mr. ANFUSO. Mr. Chairman, I would just like to comment upon what Mr. Fulton and Mr. Osmers said, and add this: About a week ago I had a meeting with some people from New York, New Jersey, and Connecticut. They felt as though there was too much concentration the other way. So I, too, would appreciate it if you would let us know that plants in our area can be of assistance. I think it is a good idea to spread it around We would be glad to cooperate.

The CHAIRMAN. Will you place in the record the distribution, the spending of money, throughout the United States?

Dr. GLENNAN. We will be glad to do that.

(The information requested appears on p. 74 in testimony of James Gleason.)

The CHAIRMAN. You might make note of all the members of the committee to be sure that you get enough spent in each district.

Mr. FULTON. I am serious about it.

Mr. QUIGLEY. Mr. Chairman?

The CHAIRMAN. Mr. Quigley.

Mr. QUIGLEY. May I comment and say that I share completely the concern of my fellow colleague from Pennsylvania. I appreciate the national defense effort; I appreciate the effect on the economy. But I will be very practical about this.

Congressmen from States such as Pennsylvania, New York, Connecticut, Ohio, West Virginia—we have a real unemployment problem, 5 million people unemployed in this country. Within Pennsylvania today, 1 out of every 10 men looking for a job can't find one.

I have nothing against the State of California, but some 2 years hence, California is going to gain some seven seats in the Congress of the United States. Three of them are probably going to be taken away from Pennsylvania.

So in another 2 years, 1 out of every 10 Congressmen from Pennsylvania is going to be unemployed, too.

The CHAIRMAN. Anybody else want to plug his district, speak up.

Mr. FULTON. Mr. Chairman, may I object to putting it on that basis. I have not spoken about my congressional district, nor the

one south of me, where there is 27 percent unemployment in the congressional district of Dr. Morgan just south of me. I believe I had the floor and I want to finish one question.

The CHAIRMAN. I recognize the gentleman again, but I want to recognize some of the members at the other end. But go ahead.

Mr. FULTON. Section 2, the chairman was commenting on that particular section. I would like to point out at the top of page 3, line 1, we speak of "to be of greater urgency than the construction of any facility authorized by this act." Obviously, then, there are two or more projects of urgency that the NASA administration feels are urgent themselves which are then going to be competing for money.

The way this is stated under the proposed legislation, it makes these projects compete on the ground of greater urgency. To me, as a matter of logic, if any one of them is of greater urgency, it is unimportant to me that one is greater than the other by a slight degree.

Under those circumstances, I would have to ask you what are the proposed projects that you would have in the $500,000 class under section 2?

Dr. DRYDEN. None at the present time. This is a provision to provide for things which may come up after Congress goes home—something we do not now foresee at all. If we do not have this authority, we have to wait until you come back into session, get the authorization, and the appropriation of the money.

Mr. FULTON. Then these are really emergency funds, rather than dividing logically between various programs of varying degrees or urgency?

Dr. DRYDEN. That is correct.

Mr. FULTON. Then why don't we say it in the legislation that this is a fund which is the equivalent of an emergency fund to provide for unforeseen occasions that come up.

Dr. DRYDEN. We would have no objection to that way of handling it.

Mr. FULTON. I think this would put you behind the eight ball when you come to try to——

Mr. QUIGLEY. Mr. Chairman, will the gentleman yield for one question at this point?

Mr. FULTON. I will be glad to.

Mr. QUIGLEY. As I understand it, this authority is presently granted to NASA.

Dr. GLENNAN. That is correct.

Mr. QUIGLEY. Have you ever had occasion to exercise it?

Mr. ULMER. We have exercised it once, I believe, sir. I would like to check our records, however.

Mr. QUIGLEY. What was that?

Mr. ULMER. I will put the details in the record if we have made use of the authority.

The CHAIRMAN. That is, NACA exercised it, not NASA?

Mr. ULMER. The NACA authority carried over to the NASA.

(NOTE.—The authority provided by sec. 4 of Public Law 85–617 has not been required to be exercised by the NACA or by the NASA to date.)

Mr. FULTON. Have you no objection, then, to my striking the location out in line 3 on page 2, those three words "Laboratory, Pasadena, Calif."?

I am not denying that location, but I am saying take a broader look at it as the result of these hearings.

Dr. GLENNAN. Mr. Fulton, I would object, I think, to your striking that language. I certainly will be glad to document the reasons for our putting these facilities at the Jet Propulsion Laboratory. I think it very simply is said by saying you destroy a substantial portion of the potential good of that laboratory.

These are facilities in support of the men of that laboratory, as I said before, in their backyard.

Mr. FULTON. Can you assure me that you have checked other installations around the country that are existing to see whether they could not be modified for this purpose? I don't think that you have to have all the eggs in one basket in one place. I don't think that is necessary.

Dr. GLENNAN. Mr. Fulton, when we asked for the transfer to NASA of the Jet Propulsion Laboratory, we in effect had made the decision that this laboratory, this group of people, were the people that could contribute most to our program. Before we asked for that laboratory, we had gone through other laboratories throughout the country, largely those that had been under contract to the Army, the Navy, and the Air Force. But this was a considered decision. These were the people who had the greatest competence in this field.

Mr. FULTON. But you see what we are up against here—and that is why this is causing this question of the committee—if you are always going to go to the people with the greatest experience, you will never get outside the places where you already are. It makes a very narrow group of people that do it, and a very narrow geographic location I am sure that if Dr. Dryden will check, he will find that more than 50 percent of the missile money has been spent, prior to NASA, in California, in one State. I have no objection——

The CHAIRMAN. I think this: Before we go any further with it, we ought to have the two men from California on our committee here present—three. They are not here this morning, none of them. I think in fairness to them they ought to be present.

Mr. ANFUSO. I agree.

The CHAIRMAN. Is there any objection to notifying them we will have it out—Pittsburgh versus California.

Mr. FULTON. Of course their duty is to be here at the committee session, at the regular called session.

The CHAIRMAN. I grant you that.

Mr. FULTON. The duty is to be here. So we who are here, of course, should not be deprived of the opportunity of questioning when it is done in all fairness to see that there is distribution around the whole country, not just in a particular State or district that I might represent.

Mr. ANFUSO. Can I touch on another point?

The CHAIRMAN. I promised to recognize Mr. Daddario.

Mr. DADDARIO. Doctor, isn't the big problem here—getting back to the team—that if you were to take the jet propulsion laboratory and were to put it in some other State than California, and you moved the laboratory there, what would happen to the team? Would they move with it, or would they divert themselves and spread themselves into industry in California, and therefore you would lose the combined effort of that group?

Isn't that the reason why you are really concentrating in Pasadena the jet laboratory?

Dr. GLENNAN. You are exactly correct.

Mr. DADDARIO. The reason I asked that is because I know a very important industry in my State, running into the development of a laboratory of this type themselves, in this type of development, has had to buy a company in California for the sole purpose of getting the type of personnel because the personnel would not as a group come to another area. That is the substance of this whole problem.

Dr. GLENNAN. You are exactly right, sir.

The CHAIRMAN. Mr. Anfuso?

Mr. ANFUSO. I would like to go into another subject, if I may——

Mr. FULTON. Before you do that may I have him put something in the record with your permission.

Mr. ANFUSO. Yes.

Mr. FULTON. You spoke of checking other laboratories than the laboratory at Pasadena, Calif. Would you please put in the record what those other laboratories were that were considered.

That is all. Thank you for yielding.

(The information requested is as follows:)

Army Ballistic Missile Agency at Huntsville, Ala.
Navy Facilities at Inyokern, Calif.
Signal Corps Laboratory at Ft. Monmouth, N.J.
Ballistic Missile Division and the Space Technology Laboratories of the Air Force at Los Angeles, Calif.

Mr. ANFUSO. Dr. Glennan, you have established in NASA an Office of International Cooperation; is that correct, sir?

Dr. GLENNAN. That's right, Mr. Anfuso.

Mr. ANFUSO. Who is the director of that Office?

Dr. GLENNAN. Mr. Henry Billingsley.

Mr. ANFUSO. Henry Billingsley?

Dr. GLENNAN. B-i-l-l-i-n-g-s-l-e-y.

Mr. ANFUSO. How many personnel are currently employed in that Office?

Dr. GLENNAN. Mr. Billingsley and his secretary.

Mr. ANFUSO. How many do you expect to employ in that Office at the end of the fiscal year 1959?

Dr. GLENNAN. I think our plans call for five. Other people make substantial contributions to this Office. For instance, Mr. Smith, who testified this morning, with his worldwide, global network, is in constant contact with and supports the activities of the international cooperation efforts.

Mr. ANFUSO. Of course, you understand that under the NASA 1958 law you are charged with the responsibility for international cooperation.

Dr. GLENNAN. Yes, sir.

Mr. ANFUSO. I think it would be well for you to consider additional personnel, with that in mind. I think we can go into that, however, in the future.

You are familiar, are you not, with H. Rept. 2709 of the 85th Congress, entitled "International Cooperation, the Exploration of Space," are you not, sir?

Dr. GLENNAN. Yes, sir.

Mr. ANFUSO. Part 11 of that report makes recommendations beginning on page 14 for an extensive program of international cooperation. Its recommendations call for permanent liaison offices abroad, a comprehensive category for world projects and capabilities of individuals and research teams in friendly foreign countries, international exchanges of scientific personnel, and the training of foreign students in the space sciences.

You are familiar with that?

Dr. GLENNAN. Yes, sir.

Mr. ANFUSO. Does the NASA organization intend to carry out these recommendations?

Dr. GLENNAN. To the extent possible we certainly do.

Mr. ANFUSO. I understand from talking to you before that you have already made some agreements with some countries, is that correct?

Dr. GLENNAN. That is right, sir.

Mr. ANFUSO. You don't have to mention those countries at this time, but we would like to have that list.

Dr. GLENNAN. I will be glad to give it to you, Mr. Anfuso. This will involve several different fields of activity. The tracking field is only one. There are other fields such as the preparation of experiments for satellite packages. There are such activities as the employment of foreign nationals on our program, things of that sort.

I will be glad to talk with you at length on this.

Mr. ANFUSO. Thank you. I suppose you are considering other agreements with other countries, are you not?

Dr. GLENNAN. Yes, we are. I think it could be said that our organization is very, very much interested in securing the greatest possible cooperation with our neighbors abroad.

Mr. ANFUSO. This committee intends to cooperate with you to the fullest extent on that, Dr. Glennan.

Dr. GLENNAN. Thank you.

Mr. ANFUSO. Arrangements for tracking stations and telemetric monitoring and so forth on foreign soil must require international negotiations and agreements. You understand that.

Dr. GLENNAN. That is right.

Mr. ANFUSO. Does the Office of International Cooperation—that is, the office which you have established—participate in such negotiations?

Dr. GLENNAN. They do, sir. We use, of course, the State Department as the negotiating agent, but Mr. Billingsley is the person in our organization who monitors and indeed institutes these proceedings.

Mr. AUFUSO. He participates in the negotiations and final agreements?

Dr. GLENNAN. He just came back 2 or 3 days ago from Peru where we signed the contract there with the President of Peru.

Mr. ANFUSO. I heard about that. Is it not probable, though, nonmilitary communications satellites will also require international cooperation—indeed, worldwide cooperation, since they can be made inoperative by noncooperative countries, isn't that so?

Dr. GLENNAN. I think that this whole field is going to require this international aspect very carefully and very thoroughly investigated.

Mr. ANFUSO. That is why I repeat, Dr. Glennan—and I said I would go into that in further detail—that in my present opinion I don't think you are adequately staffed for that purpose.

Thank you very much.

The CHAIRMAN. Any further questions?

I think that covers it. If there are no further questions, Mr. Ducander, you have the backup books on this?

Mr. DUCANDER. Yes, sir.

The CHAIRMAN. All right, you will have those in the morning?

Mr. DUCANDER. Yes, sir.

The CHAIRMAN. Will you notify all the members of the committee, especially the three from California, to be on hand in the morning. We will have an open session. There is nothing executive at all in it.

Therefore, if there are no further questions, we will adjourn until tomorrow morning at 10 o'clock.

(Whereupon, at 11:40 a.m., the committee adjourned, to reconvene at 10 a.m., Wednesday, March 11, 1959.)

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., Wednesday, March 11, 1959.

The committee met at 10:07 a.m., in the caucus room, Old House Office Building, Hon. Overton Brooks, chairman, presiding.

The CHAIRMAN. The committee will please come to order.

This morning, members of the committee, we have H.R. 4990, to authorize appropriations to the National Aeronautics and Space Administration for salaries and expenses, research and development, construction and equipment, and for other purposes.

Mr. Ducander, you have a copy of the bill, do you?

Mr. DUCANDER. Yes, sir.

The CHAIRMAN. We agreed to read it for the members this morning. Would you start reading and we will pause after each paragraph to see what explanation we need and what objection there is, if there is any, before we adopt it.

Mr. DUCANDER. At the outset, Mr. Chairman, let me say the members have before them the backup books which will explain in detail any of the provisions of the bill. As I go along and read the provisions of the bill, I will refer to the page numbers of the backup books. The page numbers are in the lower right-hand corner and I will refer to that page number rather than the sections of the book.

Reading on line 3, page 1 of the bill:

> That there is hereby authorized to be appropriated to the National Aeronautics and Space Administration for the fiscal year 1959, the sum of $48,354,000 as follows:
>
> (1) For an additional amount for "Salaries and expenses," $3,354,000.

And I refer you to page 5 of the backup books. This is the breakdown of the employees—present employees—and of course it also indicates the additional employees that will be taken on in 1960. However, the committee at this point is not interested in the additional employees inasmuch as we will hear the fiscal year 1960 authorization bill sometime after Easter.

You will see that the number of employees, there is a total of 8,961. The provisions of the bill require the authorization of $3,354,000. This is not for any additional employees, but this is to pay the administration the money that they had to raise the employees—that is, for the raise in their salaries which was voted by Congress last year.

The CHAIRMAN. That was testified to yesterday. It was for the additional pay raise.

Mr. DUCANDER. Yes, sir.

The CHAIRMAN. They were to give us a figure on the additional number of employees that they have put on the payroll and not by transfer. I am wondering, do you have that figure at this time, sir?

Mr. GLEASON. No, Mr. Chairman, that is in the process of being filed right at the present time. We will have it for the record.

The CHAIRMAN. You will give it to us before the bill comes up?

Mr. GLEASON. Yes, sir.

The CHAIRMAN. Most of them are employees by transfer; is that not so?

Mr. GLEASON. Yes, sir.

The CHAIRMAN. I am sure there is no objection to that item, because there is nothing we can do about it. It is already authorized. We have already passed the bill raising the pay. We have no alternative excpt to supply the money.

Mr. DUCANDER. On page 1, line 8:

(2) For an additional amount for "Research and development," $20,750,000.

I refer you to page 256 of the backup book. Mr. Chairman, there are very few items in the bill, if you would like to have me read the justification.

The CHAIRMAN. Yes; will you do that so it will show up in the record.?

Mr. MILLER. Then I suggest, Mr. Chairman, and Dr. Hechler and several others have spoken to me, that if they have any questions about this, they ask them and you can give them a more detailed examination for some of these new members.

The CHAIRMAN. Oh, yes; that is the reason we are here. We have witnesses here available to answer any additional questions as we go along.

Mr. DUCANDER. Speaking now of the $20,750,000 for research and development:

Objectives: To provide a capability for accomplishing advanced space flight missions with vehicles where on-board human intelligence and operations are required. It will be a basic objective of the NASA to rationalize and refine the technology of man's space flight vehicles and associated systems, to achieve successful orbital flight, and recovery of a manned satellite with an ICBM booster, and drag reentry system, to evaluate the psychological and physiological effects of a space requirement on man, to establish his capabilities and limitations for performing useful missions in space, and to devise and develop improved manned vehicles with increased capabilities for performing important advanced missions.

Justification: It is becoming increasingly evident that full exploitation of the potentialities of space flight for benefiting mankind will be dependent on the development of practical capabilities for operating manned space vehicles. While it may appear in principle that

suitable instrumentation may be devised to perform increasingly complex space missions, in practice the availability in a vehicle of human intelligence and operational capabilities will prove to be the most effective method for successful accomplishment of many advanced space flight missions.

In particular, he can contribute to the tasks of space exploration and utilization and observational, analytical, and decision-making ability concerning both expected and unanticipated problems. Any vast flexibility of action for operation, correction, and maintenance of scientific and technological instrumentation and equipment that characterizes present instruments in airplanes and the scientific laboratory.

In order to provide this capability, a progressive program of research and development has been undertaken. A broad range of investigation directed to the solution of basic technological problems concerning vehicular configuration and construction, human factors, life support equipment and accommodations, launching systems, stabilization and control, reentry and recovery systems, and techniques, operational and scientific instrumentation, and other vehicular subsystems has been initiated.

On the basis of extensive studies, it has become evident that the first manned orbiting flight vehicle should be based on the use of an ICBM booster launching system and the ballistic type of drag reentry into the atmosphere. The relative simplicity and reliability of this approach in the present state of the art offers the best potentiality for early success and will yield a vehicle with a wide range of usefulness for investigating problems concerning both human and vehicular operation factors.

This vehicle is also a logical steppingstone to larger systems of the same type with greater capacity for performing both scientific, civil, and military services. In addition, it is adaptable to the investigation of both reaction-type, space-patrol, and aerodynamic and lifting systems that will give later manned space vehicles a greatly increased scope of operations.

In program phasing during the fiscal year 1959, a wide range of studies of experimental investigations is being initiated to assess the problems that will be encountered in initial development and operation of manned space flight vehicles and to establish the design requirements for the first operational vehicle.

The CHAIRMAN. Mr. Ducander, I notice there are two or three more pages there. I don't think it will be necessary to read all of that into the record.

Mr. DUCANDER. Mr. Chairman, you could turn to page 259 and that would give you a breakdown of the $20,750,000 which the administration is asking.

The CHAIRMAN. These books will be available to the members and they will be available to us when we are on the floor. Here is a breakdown on page 259.

Mr. MILLER. None of this is confidential or secret?

Mr. DUCANDER. No, sir.

Mr. MILLER. So we can have the books?

Mr. DUCANDER. Yes, sir. We have to use these books again when we have the hearings on the fiscal 1960 authorization.

The CHAIRMAN. This, however, is——

Mr. MCDONOUGH. This is supplemental to 1959.

The CHAIRMAN. $20,750,000 in the middle column.

Mr. DUCANDER. We have capsules, $4 million; boosters, $16 million; data acquisition and handling equipment, $200,000; simulators and personnel equipment for human factor research and personnel training, $500,000. All other items, $50,000, for a total of $20,750,000.

The CHAIRMAN. Questions? Mr. Miller?

Mr. MILLER. I wanted to know how you wanted to proceed. Do you want to approach each item as we go along?

The CHAIRMAN. Yes; as we go along let's approach each item and then we will come back and vote on the bill.

Mr. MILLER. Then for the record, I move that item No. 1, the $3,354,000 for adjustment of salaries, be approved.

The CHAIRMAN. You have heard that motion. All in favor say "aye?" Opposed?

The "ayes" have it.

Mr. MILLER. I move that item No. 2 for $20,750,000 be approved.

The CHAIRMAN. Are there any questions on that?

I think Dr. Hechler said he had some questions?

Mr. MILLER. I am merely doing this in the order of getting the thing through.

The CHAIRMAN. All in favor of approving that item, say "aye."

All opposed.

The "ayes" have it. The item of $20,750,000 is approved.

Number 3, Mr. Ducander?

Mr. DUCANDER. Reading on page 2, line 1——

Mr. MILLER. What page of the backup?

Mr. DUCANDER. It will be on page 311 of the backup. That will be the breakdown.

Reading on page 2, line 1 of the bill:

(3) For an additional amount for "Construction and equipment," $24,250,000, as follows:

(A) Jet Propulsion Laboratory, Pasadena, California: New facilities, improvements to existing facilities, and approximately 70 acres of land, $9,000,000.

The CHAIRMAN. Let's read the rest of that paragraph, Mr. Ducander.

Mr. DUCANDER. Reading on page 2, line 6:

(B) Various locations: Global range tracking and communication facilities and equipment, and propulsion development facilities, $15,250,000.

(b) Authorization is hereby granted whereby either the amount prescribed in subparagraph (A) or the amount prescribed in subparagraph (B) of subsection (a)(3) may, in the discretion of the Administrator of the National Aeronautics and Space Administration, be varied upward 5 per centum to meet unusual cost variations, but the total cost of all work authorized under such subparagraphs shall not exceed a total of $24,250,000.

The CHAIRMAN. This morning we were to have a witness who would explain to us the situation regarding the Jet Propulsion Laboratory at Pasadena, Calif. Is he here this morning?

Who can tell us what we have out there and what is it that is proposed to do with this money.

Mr. GLEASON. Mr. Chairman, I have a memorandum which was prepared in response to certain questions that were raised yesterday which I think with the chairman's permission I will just read.

Mr. HECHLER. Mr. Chairman, could the witness identify himself?

Mr. GLEASON. My name is Mr. Gleason. I am the Assistant Administrator for Congressional Relations.

The CHAIRMAN. I might say all the members ought to acquaint themselves with Mr. Gleason because he is over here often and he probably will be before our committee many times in the future.

Mr. HECHLER. Just for the record.

Mr. MCDONOUGH. Mr. Gleason has been on the Hill for a number of years. We have known him, those of us who have been here for awhile, and we know him as a very capable legislative director of the office of Senator Knowland for a number of years.

The CHAIRMAN. He is a good man.

Mr. GLEASON. Thank you, sir.

The CHAIRMAN. Will you proceed?

Mr. GLEASON. In the consideration of H.R. 4990 on March 10, members of the House Committee on Science and Astronautics raised several questions with respect to the geographic distribution of NASA contracts and the justification for the $9 million appropriation item requested for the Jet Propulsion Laboratory of California.

Information is submitted herein to provide some additional facts, which it is hoped will answer the questions raised. A list of negotiated contracts awarded by the National Aeronautics and Space Administration over the amounts of $25,000 is attached hereto. I believe, Mr. Chairman, that you have a list of that for the record.

The CHAIRMAN. For the record, yes.

(The information referred to is as follows:)

NASA negotiated contracts over $25,000

Contract No.	Contractor	Date	Purpose	Estimated amount
NASw-1	McKinsey & Co., Inc., Washington, D.C.	Oct. 10, 1958	Management study of organization on NASA.	$33,000
NASw-2	Catholic University of America, Washington, D.C.	Oct. 15, 1958	Research and development contract.	27,500
NASw-3	University of Minnesota, Institute of Technology, Minneapolis, Minn.	Oct. 21, 1958	do	30,514
NASw-4	University of Michigan Research Institute, Ann Arbor, Mich.	Oct. 27, 1958	do	175,000
NASw-5	The Regents of the University of Michigan, Ann Arbor, Mich.	Nov. 12, 1958	do	50,000
NASw-7	Instituto Geofisico De Huancayo, Lima, Peru.	Mar. 6, 1959	Radio tracking and receiving station located near Ancon, Peru.	75,000
NASw-8	University of Denver Denver, Colo.	Nov. 20, 1958	Research and development contract.	49,815
NASw-13	University of Virginia, Charlottesville, Va.	Dec. 11, 1958	do	34,200
NASw-16	North American Aviation Rocketdyne Division, Los Angeles, Calif.	Jan. 9, 1959	Development of 1500 K rocket engine.	102,471,761
NASw-21	Yale University, 1602A Yale Station, New Haven, Conn.	Jan. 19, 1959	Research and development contract.	110,000
NASw-24	University of Chicago, Chicago, Ill.	Feb. 2, 1959	Designing and building instrument to measure composition and energy spectrum of primary cosmic radiation.	300,280
NASw-25	Itek Corp., Boston, Mass.	Feb. 11, 1959	Developing instrumentation for determination of upper atmospheric composition, and to measure winds, diffusion, and expansion of gases in upper atmosphere.	607,250

NASA negotiated contracts over $25,000—Continued

Contract No.	Contractor	Date	Purpose	Estimated amount
NASw-28	Bell Aircraft Corp., Post Office Box 1, Buffalo, N.Y.	Mar. 2, 1959	Investigation of the feasibility of liquid fluorine-liquid hydrogen in a rocket engine.	$1,189,000
NAS1-41	CDC Control Services, Inc., Hatboro, Pa.	Nov. 6, 1958	Designing and furnishing surge control systems and pneumatic pressure ratio relieving systems for hypersonic continuous flow facility.	73,115
NAS1-38	Sperry Gyroscope Co., Division of Sperry Rand Corp., Great Neck, N.Y.	Nov. 17, 1958	Instrumentation and installation of systems in the dynamic systems vehicle.	273,135
NAS1-36	RCA Service Co., Division of Radio Corp. of America, Cherry Hill, Delaware Township, Camden, N.J.	Jan. 28, 1959	Maintenance of the AN/FPS-16 radar Wallops Island.	28,000
NAS1-108	American Cast Iron Pipe Co., Post Office Box 2603, Birmingham, Ala.	Jan. 13, 1959	Shaft fan replacement for 16-foot tunnel; furnishing and delivering.	30,480
NAS1-73	Electronic Associates, Inc., Long Branch, N.J.	Dec. 2, 1958	On-line data-transmission systems for data-reduction center.	195,500
NAS1-145	Consolidated Electrodynamics Corp., 711 14th St. NW., Washington, D.C.	Mar. 2, 1959	Galvanometers	100,000
NAS2-33	Arthur D. Little, Inc., Acorn Park, Cambridge, Mass.	Dec. 29, 1958	Design and fabrication of helium gas purifier for 12-inch hypersonic wind tunnel.	99,264
NAS3-259	Ampex Corp., 212 West St. Charles Rd., Villa Park, Ill.	Dec. 15, 1958	Recorder, magnetic tape, Ampex Corp.	31,520
NAS3-262	Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif.	Dec. 22, 1958	Furnishing propellant tank assemblies.	105,410
NAS5-51	Aerolab Development Co., Pasadena, Calif.	Oct. 3, 1958	Designing and furnishing booster hardware for TX-33 rocket motors.	69,780
NAS5-56	Consolidated Electrodynamics Corp., 511 Sheraton Bldg., 711 14th St. NW., Washington, D.C.	Dec. 24, 1958	Galvanometers, recording.	43,850
NAS5-59	McDonnell Aircraft Corp., St. Louis, Mo.	Feb. 13, 1959	Designing and furnishing manned satellite capsule.	19,450,000
NAS2-31(w)	John Sardis & Associates, 64 Pine St., San Francisco, Calif.	Jan. 5, 1959	Architect-engineer services, Ames Research Center.	30,800
NAS2-56(w)	Simpson & Stratta, 325 5th St., San Francisco, Calif.	Feb. 19, 1959	do	35,500
NAS3-100(w)	McGeorge, Hargett & Associates, Cleveland, Ohio.	Nov. 4, 1958	Architect-engineer services, Lewis Research Center.	42,500
NAS3-104(w)	Adache Associates, Inc., Cleveland, Ohio.	Jan. 14, 1959	do	33,750
NAS5-1(w)	Voorhees, Walker, Smith, Smith & Haines, 101 Park Ave., New York, N.Y.	Dec. 4, 1958	Architect-engineer services, Space Science Center.	200,000
NAS5-55	Thiokol Chemical Corp., Elkton, Md.	Dec. 12, 1958	Motor, rocket recruit	108,000

Letter contracts outstanding as of Mar. 10, 1959

Contract No.	Contractor	Date	Purpose	Estimated amount
NASw-19	University of Chile, Santiago, Chile.	Jan. 1, 1959	Operate minitrack stations, Santiago and Antofagasta, Chile.	$76,800
NASw-17	State University of Iowa, Iowa City, Iowa.	Jan. 9, 1959	Data analysis; study of magnetically trapped radiation around the earth and other planets.	311,420
NASw-6	California Institute of Technology, Pasadena, Calif.	Nov. 18, 1958	Basic engineering research and development at Jet Propulsion Laboratory.	11,456,500
NASw-31	American Bar Foundation, Chicago, Ill.	Feb. 20, 1959	Research study on the law of outer space.	5,000
NAS1-105	RCA Service Co., Camden, N.J.	Jan. 20, 1959	Design services for range operation and control equipment.	46,868
NASw-11	Bendix Radio, Baltimore, Md.	Dec. 11, 1958	Engineering services for operation and maintenance of minitrack stations in South America and Cuba.	2,400,000
NAS3-234	Solar Aircraft, San Diego, Calif.		Hydrogen-oxygen high impulse vehicle.	623,000
NAS5-63	Cincinnati Testing Laboratory, Cincinnati, Ohio.	Mar. 2, 1959	1 instrumented ablation heat shield.	40,000
NAS5-58	General Electric, Philadelphia, Pa.	Jan. 23, 1959	2 ablation shields for hypersonic satellite reentry vehicle.	80,000
NAS5-61	Minneapolis-Honeywell, Minneapolis, Minn.	Feb. 13, 1959	Design, develop, test, and install 4 attitude control systems.	770,162

Mr. GLEASON. Which shows the location, purpose and amounts of such contracts. In the list of 41 contracts submitted, it is seen that over 18 different States, including the District of Columbia, are represented.

With regard to the $9 million appropriation item requested for the relocation and expansion of facilities of the Jet Propulsion Laboratory, JPL was transferred to NASA from the Department of Defense on December 3, 1958. As indicated by the statements made at the hearings, before the decision was made to seek to obtain the services and facilities of JPL for NASA, a survey was made throughout the country of all laboratories which could provide similar capabilities and work in the specialized field of guidance, electronics, propulsion, and communications.

The sums requested for the JPL are to relocate various rocket test facilities and associated equipment to a nonhazardous location and to provide the construction of a vehicle assembly building, expansion of the guidance laboratory, and the modernization of several existing supporting facilities.

It must be emphasized that the facilities at JPL now and have been Government-owned facilities, and the sums requested are necessary in order to make the progress required in our national space program.

The new facilities and modifications of existing facilities are an integral part of the Jet Propulsion Laboratory activities and as such must be located at the laboratory.

It would serve no purpose to provide for these facilities at a location where they would be detached from the 2,300 scientific and engineering employees at the Jet Propulsion Laboratory.

That completes the statement, Mr. Chairman, which I hope will answer some of the questions.

The CHAIRMAN. I wish you would explain a little more specifically—I know I have not had the privilege of visiting the Jet Propulsion Laboratory, but explain more in detail and specifically why this is a function that must be identified with and closely connected with the Jet Propulsion Laboratory.

Mr. GLEASON. Mr. Chairman, I would like to have Mr. D. D. Wyatt, who is assistant to Dr. Silverstein, Director, Space Flight Development, address himself to that question.

The CHAIRMAN. You are Dr. Wyatt?

Mr. WYATT. No, sir.

The CHAIRMAN. Mr. Wyatt?

Mr. WYATT. Mr. Wyatt.

The CHAIRMAN. You are assistant to Dr. Silverstein?

Mr. WYATT. Technical assistant to Dr. Silverstein; yes, sir.

The CHAIRMAN. You are acquainted with the physical situation out there at Pasadena?

Mr. WYATT. Yes, sir; I am.

The CHAIRMAN. Will you explain to the committee exactly, in your own words, what we have out there and why it is necessary that this additional facilities be located at that plant?

Mr. WYATT. May I refer the committee to page 306 of this booklet. There is a foldout map or plan of the Jet Propulsion Laboratory. I might identify the present land and buildings of the laboratory which are situated in the area marked "Zone 1." I might point out that physically the right boundary of this entire plot is bounded by a dry river, an arroyo I believe they call it.

At the top of the map the area zone 2 is a hillside that rises to a flat plateau on top. Zone 3 at the bottom of the map is a flat level area just slightly below the level of zone 1. In the existing zone 1 we have the facilities that now exist at the Jet Propulsion Laboratory. I will not attempt to identify all of these, but you will notice there is a key index at the bottom of this site plan that identifies each one of these buildings. The existing buildings being shown in solid black. These are the facilities that they have installed over the past 17 or 18 years for research on both liquid and solid propellant rockets, for work on guidance, electronics, communications, tracking, and the other facets of the investigations they conduct.

You will note the shaded buildings on this map are the items that are proposed in the supplemental authorization before you. For the most part, these are located in this zone 2 which, as I said, is on a rather steep hillside. These comprise the relocated facilities for solid and liquid rocket propellant work.

They are being moved up to this zone 2 site which is contiguous to the present boundary because in so doing, it will be possible to fully satisfy the safety requirements that are now in existence for the conduct of such operations.

As was pointed out, I believe, in some of the earlier testimony, when JPL pioneered in the American rocket work they were such pioneers there were no safety standards on the handling and surrounding of the fuels and the test cells themselves. Consequently, their present cells are rather intermixed with all the other laboratory facilities that they have. They are operating about 90 percent of these on safety waivers. The waivers do not permit them to make any sub-

stantial alteration to the cells—the alterations that are required to advance into new fuels and new techniques and technologies.

Consequently, it is proposed here to move these more critical elements up on zone 2 where they can be made to conform with all the existing safety requirements.

Also included down here—I don't know in how much detail I should go—there are other buildings in zone 1 that are proposed to be added to increase the capability of the Jet Propulsion Laboratory to conduct their work in basically the electronic fields—that is, those fields relating to communications and guidance and to the assembly and checkout of the complete space vehicles, the upper stages at any rate, that have to be assembled and then run through a number of technological tests in order to verify their working.

The CHAIRMAN. Where are the 70 acres you are going to buy?

Mr. WYATT. The 70 acres are broken between zone 2, which is 60 acres——

The CHAIRMAN. Specifically where are the 60 acres in zone 2?

Mr. WYATT. This is the zone at the top of the map.

The CHAIRMAN. All of zone 2?

Mr. WYATT. All of zone 2.

The CHAIRMAN. Is 60 acres?

Mr. WYATT. Sixty acres. Zone 3 at the bottom of the plot plan is approximately 7 acres.

The CHAIRMAN. How much are you going to pay for that 60 acres in zone 2?

Mr. WYATT. It is estimated, I believe, at $300,000.

The CHAIRMAN. What are you going to pay for the 7 acres?

Mr. WYATT. $75,000 is the estimate.

The CHAIRMAN. That is $25,000 an acre?

Mr. WYATT. No, sir; a little over $10,000 an acre—$75,000 for 7 acres.

The CHAIRMAN. How far out of Pasadena is this?

Mr. WYATT. I believe this is on the boundary of Pasadena. I am not exact on this. I think the boundary of Pasadena is right near the bottom of zone 3. It is very close to it. This I think, is either just inside Pasadena or just on the boundary outside.

Mr. TEAGUE. Mr. Chairman?

The CHAIRMAN. Mr. Teague.

Mr. TEAGUE. This zone 2: How far up on that hillside does that go?

Mr. WYATT. The boundary line would go clear to the top of the hill.

Mr. TEAGUE. Could that land ever be used for anything else if you don't buy it for this purpose?

Mr. WYATT. The land extending beyond this on over the top of the hill and down the other side is being developed for homes—on the other side of the hill.

The CHAIRMAN. What about zone 3? Is there any development around that?

Mr. WYATT. No, sir; there is no development there.

Mr. TEAGUE. Isn't there a State park around it?

Mr. WYATT. If you can locate it on the map, you see the road on the left side coming up. The National Forest Service has a plot in this little jagged section over between the road and the left boundary of zone 2 and zone 3.

Mr. SISK. Mr. Chairman?

The CHAIRMAN. Mr. Sisk.

Mr. SISK. Do you not have a map that you can show us something about the location of this? I think it would be informative to the committee if we had a map here indicating the city of Pasadena and the general area. This map doesn't give us any idea as to the specific location of the area.

Mr. GLEASON. We don't have it, Mr. Sisk.

Mr. SISK. I have been there and I know about where it is, but I think it would be well if you had a map that could give us an indication of the location here.

Mr. GLEASON. Unfortunately we don't have that with us.

Mr. TEAGUE. It is almost in downtown Pasadena. You can get downtown in 6 or 7 or 8 minutes.

Mr. WYATT. It is very near a freeway——

Mr. TEAGUE. A big, new freeway.

Mr. WYATT. Yes. I would not personally refer to it as downtown Pasadena, the way I would get to it.

Mr. TEAGUE. It takes but a very short time.

Mr. WYATT. Yes; 10 or 12 minutes because of the excellent freeway from downtown Pasadena.

The CHAIRMAN. Have you had this property appraised?

Mr. WYATT. These costs are based on Corps of Engineer estimates of the appraisal. Zone 3, I might point out, has been under lease and has been used by JPL in the development of the Sergeant missile for certain vehicular tests where they are driving the vehicles around that are part of the Sergeant program.

The owner of zone 3 has indicated he does not wish to renew that lease.

Mr. MCDONOUGH. Mr. Chairman?

The CHAIRMAN. Mr. McDonough.

Mr. MCDONOUGH. Mr. Gleason, couldn't this be oriented by identifying it as approximately at the base of Mount Wilson in the Pasadena area?

Mr. GLEASON. Yes, sir.

Mr. MCDONOUGH. It is rolling country, and if this facility were not adjacent to it—I am speaking for the benefit of the committee, who may not be familiar with the location—if this institution were not adjacent to it, it would be very desirable for sightly homesites in the low hill country.

The estimate per acre that has been indicated to me is not by any means excessive because I know they are paying that much for land out in the San Fernando Valley flat country.

Mr. RIEHLMAN. Mr. Chairman, will the gentleman yield on that point?

Mr. RIEHLMAN. Did I understand the Corps of Engineers had made an appraisal of the property?

Mr. ULMER. This is our understanding, sir.

Mr. RIEHLMAN. Have you any assurance it can be procured for that price?

Mr. ULMER. We have no assurance, sir, and we have no options; but we will do the very best we can to work within that price.

Mr. MCDONOUGH. And you have condemnation proceedings.

Mr. WYATT. There are condemnation proceedings on zone 2, not on zone 3.

The CHAIRMAN. You mean they have already begun?

Mr. WYATT. There is a condemnation of a leasehold on zone 2.

The CHAIRMAN. You have already started condemnation?

Mr. WYATT. The Army did that on the condemnation of a leasehold.

The CHAIRMAN. Your acquisition is through the Army engineers in the usual program they follow in obtaining property? Is that right?

Mr. ULMER. No, sir; the acquisition will not be through the Corps of Engineers. They made the original estimate because prior to the switch over from the Army to NASA, JPL was under the control of the Army. So these estimates were obtained by them.

We will acquire the land through our normal procedures with the Department of Justice.

The CHAIRMAN. Any further questions?

Mr. DUCANDER. Mr. Chairman, I think the record should show why it is necessary that this item be included in a supplemental and why it is not being included in the regular 1960 authorization.

The CHAIRMAN. I think the record ought to go further than that and show why each item has to be in a supplemental, because this supplemental is of an emergency nature and you ought to know why it is necessary to put it in a supplemental.

Mr. MILLER. Mr. Chairman, I wonder if anyone could tell us what investment the Government presently has at this site?

Mr. ULMER. The amount is approximately $50 million there at JPL—the Government investment in the Laboratory.

Mr. MILLER. Approximately $50 million?

Mr. ULMER. Facilities and equipment.

Mr. WYATT. Sir, I can give a general answer, and we can support it with details, if you choose.

The CHAIRMAN. Surely.

Mr. WYATT. The program that JPL is working on for NASA is a very vital program. In particular, we are looking to them for the development of engines using the so-called storable fuels; and we are looking to these at the earliest possible date in our total vehicular program.

This puts urgency on the relocation of those facilities related to the actual test rocket firings. The guidance and communications are also among the primary reasons why in our evaluation of agencies around the country that might contribute to the NASA program, it led to our request that JPL be transferred from the Army to the NASA because of their very excellent and outstanding work in these areas.

They are, however, completely underequipped to do the large job which has to be done now in this new space flight area. We are asking as rapidly as possible that we give them adequate equipment and buildings in the guidance, communications, and instrumentation areas so that they can get on with the job as rapidly as possible.

The CHAIRMAN. Mr. Ducander, I am going to interrupt the proceeding here and get you to call the roll of the committee and we can add to it whoever comes in later. But I wanted the record to show who is present at this time.

Mr. DUCANDER. Mr. Brooks?

The CHAIRMAN. Here.

Mr. DUCANDER. Mr. Martin? [No response.] Mr. McCormack? [No response.] Mr. Fulton?
Mr. FULTON. Here.
Mr. DUCANDER. Mr. Miller?
Mr. MILLER. Here.
Mr. DUCANDER. Mr. McDonough?
Mr. MCDONOUGH. Here.
Mr. DUCANDER. Mr. Teague?
Mr. TEAGUE. Here.
Mr. DUCANDER. Mr. Chenoweth?
Mr. CHENOWETH. Here.
Mr. DUCANDER. Mr. Anfuso?
Mr. ANFUSO. Here.
Mr. DUCANDER. Mr. Osmers? [No response.] Mr. Sisk?
Mr. SISK. Here.
Mr. DUCANDER. Mr. Van Pelt?
Mr. VAN PELT. Here.
Mr. DUCANDER. Mr. Mitchell? [No response.] Mr. Baumhart?
Mr. BAUMHART. Here.
Mr. DUCANDER. Mr. Quigley?
Mr. QUIGLEY. Here.
Mr. DUCANDER. Mr. Bass?
Mr. BASS. Here.
Mr. DUCANDER. Mr. Hall? [No response.] Mr. Riehlman?
Mr. RIEHLMAN. Here.
Mr. DUCANDER. Mr. Wolf?
Mr. WOLF. Here.
Mr. DUCANDER. Mr. Karth?
Mr. KARTH. Here.
Mr. DUCANDER. Mr. Hechler?
Mr. MOELLER. He is here, but just stepped out.
Mr. DUCANDER. Mr. Daddario? [No response.] Mr. Moeller?
Mr. MOELLER. Here.
Mr. DUCANDER. Mr. King?
Mr. KING. Here.
Mr. DUCANDER. Mr. Roush?
Mr. ROUSH. Here.
The CHAIRMAN. I think that establishes that a quorum is here. Are there any further questions in reference to this particular item? Mr. Fulton?
Mr. FULTON. Do we have what the future plans are with regard to JPL?
The CHAIRMAN. You can answer that in a general way, because of course this is not the regular bill but is supplemental.
Mr. WYATT. Yes, sir. As far as physical facilities at the Jet Propulsion Laboratory are concerned, I believe we can say that we would not contemplate any physical land expansion beyound these boundaries. The land is simply not available. These are the last lands that are available contiguous to the Laboratory.
I cannot tell you at this time the exact requests that we may come back with before the committee in future years. We will probably from time to time find it necessary to make additions of facilities related to the problem areas as they develop and as it becomes clear

what kinds of facilities we need to prosecute the problems which JPL is ideally situated to attack.

Mr. GLEASON. I might say, Mr. Fulton, there is nothing in the 1960 budget for facilities at JPL.

Mr. FULTON. The problem is, what is the policy of NASA on its R. & D. facilities? Will this be concentrated at one point, or will you use both private and public facilities and existing facilities at other points in other parts of the country? What is your general policy?

Mr. GLEASON. It is definitely the policy of NASA to acquire these facilities or use facilities, public or private, wherever they can be located. There is no desire to locate them in any one area over another area.

Mr. FULTON. Where else do you intend to do R. & D. work on propellants?

Mr. WYATT. We are doing R. & D. work on propellants at the Lewis Research Center at Cleveland, Ohio, one of the NASA research centers.

Mr. FULTON. Likewise you are doing some research south of there?

Mr. GLEASON. Yes, at Plumbrook.

Mr. FULTON. What are you doing there?

Mr. WYATT. That is an extension of some of the rocket work from the Lewis Research Center, and of course we have a nuclear reactor at the Plumbrook site.

The CHAIRMAN. Which site?

Mr. WYATT. Plumbrook, near Sandusky, Ohio, about 50 miles from Cleveland.

Mr. FULTON. You likewise have test stands, do you not, in that area?

Mr. WYATT. Yes, sir. As I say, for an extension of some of the work. That is a more remote site than the Lewis site, and some of the more hazardous work is being moved from the Lewis site out to the Plumbrook site.

Mr. MCDONOUGH. Mr. Chairman?

The CHAIRMAN. Mr. McDonough.

Mr. MCDONOUGH. The location of these new facilities would be an advantage to the testing that we are now making at the Rocketyne plant, North American, in the Santa Susanna Hills of California, would they not?

Mr. WYATT. The results of the work done here will be applicable to the large rocket developments. Let me emphasize that the facilities that are to be located here are not for the development of very large rockets. These are rather small research rockets.

The principles uncovered here are then applied by the contractor such as Rocketdyne, Aerojet, and other rocket contractors around the country.

Mr. MCDONOUGH. These are captive tests?

Mr. WYATT. These are captive tests in test stands of rather small rockets running only 1,000 pounds or so thrust.

Mr. FULTON. On the question of the use of existing facilities—the expense of purchasing of new land, $10,000 an acre, and building facilities that might duplicate others in other branches of the Government—would you comment on the ABMA facilities for testing vertical stands at Huntsville, Ala.?

Mr. WYATT. Yes, sir. The ABMA facilities are for the development testing of very large rockets, work that cannot be done at the jet propulsion site here. Again let me emphasize the work here is of very small rockets, 1,000 pounds or so thrust.

The ABMA has facilities that will permit upward of a million pounds thrust engines to be tested, the complete stable of present engines and extensions into future large engines.

This is an entirely different thing. This is the development testing of engines that have been built and are proposed for flight. At the Jet Propulsion Laboratory, it is a laboratory test of principles of future engines, fuels, injectors, and so forth.

Mr. MCDONOUGH. That would later be built——

Mr. WYATT. That would later be built into full-scale engines; yes, sir.

Mr. FULTON. How many types of propellants are you proposing to do R. & D. upon at this particular JPL site?

Mr. WYATT. We are proposing work on solid propellants, advanced solid propellants, and on the storable liquids for the most part. It is not proposed at this time to go into the high energy, very high energy, fuels at this site. That will be done at Cleveland.

Mr. FULTON. Certain companies are also engaged in the development of solid propellants such as Phillips Petroleum. Another type is the RCIA type of fuel. Are you intending to use private industry on the R. & D. on these various kinds of propellants in solid and liquid form?

Mr. WYATT. As far as solids are concerned, we have a nominal support of solid propellants in the industrial field. We are relying mostly upon the very large support that the Defense Department is putting into the R. & D. effort. We hope to capitalize and to utilize the results of the basic R. & D. money that they are putting in very large quantity into these plants.

Mr. FULTON. That is one of my previous points. You are not duplicating what is already being done in ABMA or the Department of Defense on facilities, nor on programs?

Mr. WYATT. No, sir, we believe not—not in any serious form.

Mr. FULTON. Are you making adequate use of private industry R. & D. before we go to the expense of expanding Government facilities?

Mr. MILLER. Will the gentleman yield there?

Mr. FULTON. Yes.

Mr. MILLER. When you speak of using private facilities and private industry in this field, isn't it true that the Government has to subsidize and pay for those facilities? Isn't it true that for all of the facilities that were used throughout the Defense Department in the whole aerodynamics industry, money had to be advanced to private companies that in effect you could call them private companies but they become management agencies?

Mr. FULTON. My position on that is that what private industry can do and do well, Government should not invade the field of, nor do itself. My question then is: Have you given adequate attention to the possibility of private industry working along in this field as well as constructing Government facilities?

My question secondly: Are Government facilities already in existence in other departments adequate, and could they be used instead of going to the expense of new facilities wherever they might be?

Mr. WYATT. In answer to the first question, sir, it is our policy to utilize the facilities that exist in private industry as greatly as we can and not to duplicate any of those facilities knowingly in the in-house effort.

Mr. FULTON. On that point, will you research the Phillips Petroleum type fuel at JPL?

Mr. WYATT. I am sorry, I cannot say at this point. I do not know precisely the details. Let me amplify, if I may, sir, on this. The Jet Propulsion Laboratory was one of the main arms of the AOMC—the Army Ordnance Missile Command—and had certain research functions as a part of AOMC which will be continued in this.

The expansions that we contemplate here were all approved expansions of AOMC prior to the transfer to JPL.

The CHAIRMAN. Let me suggest this. You have two questions which he has asked you. You haven't answered one yet.

Mr. WYATT. I am sorry, sir.

The CHAIRMAN. We jumped to the third question.

Mr. MCDONOUGH. He interrupted him. That is the reason he didn't answer.

The CHAIRMAN. I wanted your answer to the other question in the record.

Mr. FULTON. The second question was an amplification of the first question.

Mr. WYATT. Please repeat the question, Mr. Fulton.

(Pending question read.)

Mr. WYATT. Sir, I would say no, there are not. I was trying to explain this in terms of the fact that these were facilities of the Government as part of AOMC that were an integral part of the Defense Department that has had certain functions for the Defense Department.

Those functions for the Defense Department will be continued here. They will also serve the NASA functions. We do not think that the same capability exists, the same combination of personnel talent and facility requirements exist, any place else in the Government.

Mr. FULTON. That, of course, raises a problem on the basis of how we expand our program, whether in every case we simply expand where the personnel talent are located, or whether we decide for strategic and economic reasons that we will, through the country—not just in one State—have various projects going both in private industry and Government facilities for the research and development on various levels—for example, on propellants; secondly, on guidance and control; thirdly, on structures; fourthly, on materials; fifthly, on radiation; and various fields of that type.

Would you comment on your policy in that particular field?

Mr. GLEASON. Mr. Fulton, I think as a possible answer to that question, a lot of our existing R. & D. funds which approximately $200 million—I don't have the exact percentage—but I am informed that the greatest bulk of that amount of money is let by contract.

Some of this will go to ABMA, which in turn will let it out to private industry. But I think that is a pretty firm expression of our policy up to this point.

The CHAIRMAN. Any further questions? I want to ask you just for the purpose of the record, two questions. In the first place, if you don't buy this 70 acres and you don't attach this to the present facility, will it cost more money to set up a separate facility and put it elsewhere?

Mr. WYATT. Yes, sir.

The CHAIRMAN. Then, too, if you separate this from the Jet Propulsion Laboratory, will it make for less of an integrated work than you have when it is built, as your diagram says it will be built, as a part of the present Laboratory?

Mr. WYATT. Very definitely, sir. It would be a much less advantageous operation.

The CHAIRMAN. What is the pleasure of the committee? If there are no further questions, do I hear a motion?

Mr. MILLER. I move the item of $24,250,000 be put——

Mr. DUCANDER. Mr. Chairman, you haven't covered global tracking yet.

The CHAIRMAN. Why not just take (A) then, on page 2, line 3, subsection (A), $9 million.

Mr. MILLER. I move that it be approved.

Mr. MCDONOUGH. I second the motion, Mr. Chairman.

The CHAIRMAN. You have heard the motion. It is duly seconded. And further talk or question on it? If not, are you ready for the question?

All in favor of approving it as written will please say "Aye."

[Chorus of "Ayes."]

The CHAIRMAN. All opposed?

[There were none.]

The CHAIRMAN. The "Ayes" have it. The item is approved.

Mr. DUCANDER. The next item, Mr. Chairman, reading on page 2, line 6:

(B) Various locations: Global range tracking and communication facilities and equipment, and propulsion development facilities, $15,250,000.

The breakdown is on page 318 of the backup books.

The CHAIRMAN. I don't think we need to read all of that in there. Mr. Fulton has a question on it.

Mr. FULTON. Are there any facilities now in existence which could be used in whole or in part for the purposes of subsection (B) so that we would not have to spend the full amount on the three separate locations that are proposed? For example, does Australia have any facilities or would they contribute maybe land or part of the cost? In England, if we changed the course of the proposed man-in-space launching and had a different inclination on it, if we changed our methods couldn't we save some money on this?

Mr. WYATT. Sir, basically the items shown here are part of an integrated picture of the overall tracking requirements arrived at from discussions between the NASA and the Department of Defense and ARPA. It has been agreed that these are needed in addition to any facilities which now exist.

These represent, in part, NASA's share of the overall global tracking network that is required in the total space program.

Specifically, as far as specific sites are concerned, in Australia we have some tracking facilities, but not the large dish that is required. This will be located, I believe, on land that is already available to the Government down there.

We do not propose to acquire new land.

Mr. FULTON. How about in South Africa?

Mr. WYATT. We have not made a final site selection in South Africa. We do not intend to purchase any land in South Africa.

Mr. FULTON. Have you tried to get cooperation of the Government?

Mr. WYATT. Yes, sir, we have some tracking stations down there now as part of the minitrack network.

Mr. FULTON. What method have you used to estimate the figures in arriving at $15,250,000 for the three installations?

Mr. WYATT. Sir, which figure were you referring to?

The CHAIRMAN. I suggest this at this point, that in the record we include item 2 there, "Cost estimate," which is a breakdown of that amount.

(The cost estimate is as follows:)

2. COST ESTIMATE

Tracking facilities

Extension and improvement of satellite electronic tracking stations	$3,300,000
Equipment and facilities for 4 new stations at $531,000	2,124,000
Antenna arrays	110,000
Electronic equipment	346,000
Site preparation and utilities	75,000
Modification and improvement of existing electronic tracking stations	1,176,000
Rework of station to change frequency: 12 stations at $60,000	720,000
Digital read-out equipment: 6 stations at $26,000	156,000
Additional antenna arays: 6 stations at $50,000	300,000
Facilities for space probe tracking network	3,500,000
Initial site preparation, roads, utilities, housing (2 stations)	1,900,000
85-foot diameter antenna systems (2)	950,000
Radio receiving equipment (2)	460,000
Antenna servo control systems (2)	190,000
Equipment for support of manned space vehicles	5,250,000
Precision radar system for insertion tracking and guidance	1,750,000
Precision radar system for initial reentry tracking and control	1,750,000
Precision radar system for midcourse and landing tracking	1,750,000
Total estimated cost	12,050,000

Propulsion development facilities

Rocketdyne, Santa Susanna:	
Gas generator and control facilities	$471,000
Turbopump test facilities	563,000
Rocketdyne, Canoga Park: Laboratory and manufacturing equipment	366,000
Total, contractor sites	1,400,000
Edwards Air Force Base:	
Stand 2–A	219,300
Stand 1–A	944,500
Stand 1–B	636,200
Total, Edwards Air Force Base	1,800,000
Total estimated cost	3,200,000

Mr. FULTON. What method did you use?

Mr. WYATT. These are based upon prevalent costs for the equipment and modification of sites based on experience.

Mr. FULTON. You didn't make a study right on the site as to the cost for an overall figure?

Mr. WYATT. No, sir; these are based on the costs of comparable equipment without having pinpointed the site, with a nominal allowance for site development costs.

Mr. FULTON. Then on the purchase of this equipment, do you intend to do it by public bid, or will this be by simple negotiation, with certain selected people? I favor the public bid approach.

Mr. ULMER. Mr. Fulton, as I discussed yesterday, it is the firm policy of NASA, wherever possible, to do all of its contracting on the basis of sealed bids. There are cases, as I tried to explain, where you simply cannot write detailed plans and specifications. These are the cases where the technology has moved so rapidly that you cannot pinpoint in detail what you are buying.

In this type of endeavor, we do negotiate; but even in those cases we try to conduct what we call a competitive negotiation, where a number of competent firms are drawn together.

We get their estimates. It is comparable to bidding, but it is not the sealed bid type of bidding.

Mr. FULTON. This type of dish was made in smaller and larger sizes before, so what type is this? Isn't this for public bid?

Mr. ULMER. I am not up to date on the technical details of the proposal.

The CHAIRMAN. Will you indicate, gentlemen of the committee, if you can't hear the witness. Don't hesitate at all to indicate that.

Will you, sir, repeat what you had to say?

Mr. ULMER. Yes, I am sorry. I am not familiar enough with the technical details of the dishes proposed under this project. But if at all possible, they will be placed under contract on a competitive bid procedure. If not, we will certainly try to follow the procedure of competitive negotiation.

We will canvass every competent firm in the country who is capable of doing this type of work before we award the contract.

Mr. FULTON. Do you advertise so that firms, other than just a certain group, will know that this kind of equipment is under contemplation and under bid?

Mr. ULMER. We do not personally advertise, but copies of our bids are released to commercial concerns which do this type of work. I believe Dodge Reports is one, and there are others in other parts of the country. So our prospective contracts are given wide circulation.

Mr. FULTON. There are no preferred companies, are there, that get any information ahead of time or any more information than the ordinary company gets from your agency?

Mr. ULMER. Absolutely not, sir.

Mr. FULTON. So that any claims like that are not true?

Mr. ULMER. To my knowledge, sir, I have heard of no such claims.

The CHAIRMAN. If anybody here has any such information, I wish they would present it to the committee.

Mr. FULTON. Have you made any recent check to find if that was true in your agency?

Mr. ULMER. I have heard of no such complaints, sir.

Mr. FULTON. Have you made a check to see whether any such situation was the case in your agency lately?

Mr. ULMER. I personally have not made such a check, sir. But if such a claim were made, I am certain it would be brought to the attention of the Administration promptly.

Mr. FULTON. If you have made such a check, will you please put it in the record at this point.

The CHAIRMAN. He said he hadn't made it.

Mr. GLEASON. We will be glad to make such a check, Mr. Fulton, and put it in the record.

Mr. FULTON. I wish you would. I believe you have some indirect information. So I would like to put it in the record.

The CHAIRMAN. Mr. Gleason, you are Assistant Administrator for congressional relations. I suggest you make a check and if you find anything irregular, will you tell this committee right away?

Mr. GLEASON. Absolutely, sir.

Mr. FULTON. Just to see that the policy is set correctly?

The CHAIRMAN. If there is information about bids leading out to favored contractors before it is given to the public generally, I think it is highly irregular. The committee should know it.

Mr. GLEASON. Absolutely.

The CHAIRMAN. If anybody here on the committee, or any witness here has any such information, the committee would like to have it.

Mr. FULTON. May I make my point clear. I want you to see that your policy is correct and to check it, and that there is no charge.

If there is anything other than regular policy, but please check it and let us here know.

Mr. GLEASON. I understand, sir.

(The requested information is as follows:)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,
OFFICE OF THE ADMINISTRATOR,
Washington, D.C., March 18, 1959.

MEMORANDUM

In the consideration by the House Committee on Science and Astronautics of H.R. 4990, questions were raised by the members of the committee as to whether NASA's policy against giving advance information on contracts to prospective bidders had been reviewed recently. Since July 1955, formerly NACA, and now NASA has had in effect a regulation stipulating that procurement per-

sonnel must be fair in dealing with prospective contractors. The regulation states that unfair practices to prospective contractors includes the following:

"Revealing to one prospective contractor, in advance of soliciting proposals from other contractors, the fact that a certain procurement is about to be placed or negotiated. This is not intended to preclude preliminary inquiries, discussions or investigations during the procurement planning stage."

No evidence has been brought to NASA's attention by any contractor that this policy, or any other unfair contract policy, is being violated. However, in view of the committee's express concern, an agency memorandum is being forwarded to all NASA personnel which reiterates NASA's policy in this regard.

Needless to say, if the committee, or any members of the committee feel that this policy is being violated, we would urge that the situation be brought to our attention immediately.

JAMES P. GLEASON,
Assistant Administrator for Congressional Relations.

The CHAIRMAN. Any further questions? Mr. Roush?

Mr. ROUSH. I notice that the amount in the bill calls for $15,250,000. On page 319 of the report, the total amount set out is $12,050,000, which apparently does not include the equipment for the support of manned space vehicles.

The CHAIRMAN. Even that is $50,000 off there.

Mr. DUCANDER. If you move back about 3 pages, Mr. Roush, or move forward, I should say, about 3 pages, I think you will pick up the other figure which, when added to the $12 million figure, will give the total.

Mr. ROUSH. Then what we are considering does not include the equipment for the support of manned space vehicles. Is that right?

Mr. ULMER. May I explain it this way, sir. If you will turn to pages 318 and 319, the sum of the items shown is $12,050,000. On page 321 there is another listing which totals $3,200,000. That is for propulsion development facilities. We have not yet discussed that item. The sum of the $12,050,000, plus the $3,200,000 is the $15 million figure that appears in the bill.

Mr. ROUSH. On page 319, however, that figure does not include the $1,750,000 does it?

Mr. Wyatt. Yes, sir, it does.

Mr. ULMER. Yes, sir. The $12,050,000 figure is made up of $3,300,000 on page 318, $3,500,000 for facilities for space probe tracking network, and $5,250,000 for equipment for the support of the manned space vehicles. Those three items total $12,050,000.

Mr. ROUSH. Then you go to this page 321 to pick up the other?

Mr. ULMER. Correct, sir.

The CHAIRMAN. The breakdown on 321 should be included in the record along with the breakdown on page 319 and 318.

Mr. DUCANDER. I have given it to the reporter, Mr. Chairman.

The CHAIRMAN. Any further questions in reference to this?

If not, do I hear a motion?

All in favor of approving that item make known by saying "aye."

Opposed?

None. The ayes have it. It is approved.

Take (b)

Mr. DUCANDER. Reading now on page 2, line 9, (b):

Authorization is hereby granted whether either the amount prescribed in subparagraph (A) or the amount prescribed in subparagraph (B) of subsection (a)(3) may, in the discretion of the Administrator of the National Aeronautics and Space Administration, be varied upward 5 per centum to meet unusual cost variations, but the total cost of all work authorized under such subparagraphs shall not exceed a total of $24,250,000.

The CHAIRMAN. I think that was explained the other day. That is the customary provisions in most of these laws.

Any further questions?

Mr. MILLER. I move its adoption.

The CHAIRMAN. You have heard the motion. Any questions?

Mr. FULTON. The question there on line 13 of course if there is a variation upward on one, there is going to be a variation downward on another. So I would strike the word "upward."

I think that would give you a 5-percent variation.

The CHAIRMAN. That would then permit an increase.

Mr. MILLER. I think this is the usual language that is put into these bills. It is not new. It is not written specifically for this bill.

Mr. ULMER. No, sir; it is standard language that has been carried in several bills. There is no objection, of course, to coming below the estimate. The authorization was written this way to give the authority to go above, provided we live within the total amount of money provided by the bill.

The CHAIRMAN. You have heard the motion. Any further discussion? If not, all in favor of this subsection (b) make known by saying aye.

Opposed?

The ayes have it. The subsection is approved.

Take section 2, Mr. Ducander.

Mr. DUCANDER. Reading on page 2, line 17:

SEC. 2. Any amount, not to exceed $500,000, of the funds appropriated pursuant to authorization of subsection (a)(3) of the first section for the construction of facilities described under such subsection may, with the approval of the Bureau of the Budget, be used for the construction of new research facilities or for the modification of existing research facilities not specifically authorized in this Act, if such construction of modification is deemed by the Administrator of the National Aeronautics and Space Administration to be of greater urgency than the construction of any facility authorized by this Act; but no such funds shall be used for the construction or modification of any facility if funds for such construction or modification have been previously denied by the Congress.

I have an amendment, Mr. Chairman, which the committee asked yesterday be drawn.

The CHAIRMAN. Read the amendment, Mr. Ducander.

Mr. DUCANDER. The amendment would be as follows:

On page 3, line 2, following the word "Act," change the semicolon to a colon, strike the balance of line 2, and all of lines 3, 4, and 5, and add the following:

I will say at this point, Mr. Chairman, before reading the rest, that in order to get at what we consider to be legislatively correct from a draftsmanship standpoint, that we are inserting new language after the word "Act" on line 2, page 3, and then repeating the following three lines in a proviso. The amendment would then read:

Provided, That upon reaching a final decision to implement, the Administrator or his designee shall notify the Committee on Science and Astronautics of the House of Representatives and the Committee on Aeronautical and Space Sciences of the Senate, of the cost of such construction of new research facilities or the modification of existing research facilities: *Provided further*—

and this is where you pick up the three lines that we struck—

That no such funds shall be used for the construction or modification of any facility if funds for such construction or modification have been previously denied by the Congress.

Mr. MILLER. Mr. Chairman?

The CHAIRMAN. Mr. Miller?

Mr. MILLER. This is merely writing into this act a provision that has long been in all of the military construction acts that go to the Committees on Armed Services of the two Houses as a safeguard of this legislation.

Mr. DUCANDER. That is right.

Mr. FULTON. May I ask a question?

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. Is there proper provision for the time of notification?

Mr. DUCANDER. No, we did not put in a time, aside from "shall notify the committee upon reaching a final decision to implement" they shall then, or the Administrator shall then, notify the committees.

The CHAIRMAN. That would be a timely notice right after the decision is made.

Mr. DUCANDER. He must then notify the committees.

Mr. FULTON. So the decision is first made firmly and then the notification is made. I will ask my colleagues from the Armed Services Committee, Mr. Brooks and Mr. Miller: Is that likewise the same practice in the Armed Services Committee?

The CHAIRMAN. Yes, that is what the Armed Services Committee is doing now. At one time the Armed Services went further than that, requiring a return of the project. But I think that has been abandoned, hasn't it, Mr. Ducander?

Mr. DUCANDER. Yes, sir; it has. The Department of Justice has ruled on this matter. The Department of Justice feels that if you authorize the executive departments to do something and then make them return to the committees of Congress before you allow them to do what you have already authorized them to do, you are violating the separation of powers between the legislative and the executive branches.

This is designed to allow the committee of Congress to take action to prevent this move if they wish.

The CHAIRMAN. That doesn't go as far as the original language went, but it does give the committees in Congress information as to what is going on and ample time for the Congress to take action, should it so desire.

Mr. MILLER. This has been tested and is legal language and is not subject—I think you should stress that—to court tests.

Mr. DUCANDER. No, sir; I don't believe it is. I might also say, Mr. Miller, that this year it was again included in the military construction bill now pending before the Armed Service Committee.

Mr. FULTON. Then just to set it exactly: That means that at the time the basic firm decision is made, there is a notification, and that notification comes before there is either contract or obligation by the Administrator.

Mr. DUCANDER. I don't know that I could say that it would come before contractual obligations had been entered into. The way the language reads, that upon reaching a final decision to implement, the Administrator—to use an extreme sample—would make his decision to implement and then would contract on the same day, the committee probably wouldn't be notified until the next day.

Mr. FULTON. What would Mr. Gleason say as to that practice so we get it straight?

Mr. GLEASON. I would say, Mr. Fulton, I think as a practical matter, any executive officer would be a little reluctant to sign the final papers on something before the notification takes place.

As a legal proposition, of course, they are authorized to do so.

Mr. FULTON. So that generally, other than in an emergency or rush situation, the committee would receive notification before the obligation was made?

Mr. GLEASON. I think this is usually the case.

The CHAIRMAN. I would like to say this also: This language does meet with the approval of the Attorney General. At least he says it isn't illegal and it gives the committee notice of what is going to happen. It is a language that has been in use in the past.

Mr. MCDONOUGH. Mr. Chairman, assuming the situation was before the committee now, something we previously authorized and the department came back and informed you they were going to do, does this language give the committee the privilege of amending or repealing the action—denying the procedure?

The CHAIRMAN. Of course, the Congress can do anything it wants. Congress could revoke the authorization.

Mr. DUCANDER. I would say, Mr. Chairman, that in such a case, any member of the committee, and particularly the chairman, would introduce a bill to prevent them from doing it and then would notify the Administrator that the committee did not wish them to go ahead pending hearings on the bill.

Mr. MCDONOUGH. Another question: Does this language then make this procedure discretionary or mandatory?

Mr. DUCANDER. Mandatory, sir.

The CHAIRMAN. Mr. Miller?

Mr. MILLER. I was just thinking, for the benefit of Mr. McDonough, that during the war and immediately after there was a lot of looseness in the handling of funds in using this transfer provision. So this was designed to be a brake on any sneak end runs that might be made. They have got to smoke them out in the open. I doubt that a legitimate contractor would even want to sign a contract until he knew that this had been complied with because his contract might be in jeopardy.

So it is a safeguard. I know the Armed Services Committee is very seldom ever called upon to use it. As a matter of fact, it has become quite a chore, because every day you have submitted to you—and, incidentally, we do the same thing in the Merchant Marine and Fisheries Committee when it comes to handling leases or anything that disturbs game refuges. So it is proven in these cases to be a very fine check, and the departments, I think, welcome it because it takes them off the hook.

Mr. FULTON. Could I ask Mr. Miller: Is the monetary amount of the limit the usual limit?

The CHAIRMAN. $500,000?

Mr. FULTON. The amount that they will have to notify about when they go above?

Mr. MILLER. This is the transfer between one project to another we are talking about.

Mr. FULTON. How about the general limit in the amount of money? Does that correspond with what other agencies and departments——

The CHAIRMAN. Oh, yes.

Mr. ULMER. The 5-percent limitation is relatively standard, sir, throughout the Government; the amount of the emergency authority provided in section 2 varies from agency to agency, depending on their individual needs.

Mr. FULTON. That is what I wanted to know.

The CHAIRMAN. I want to say to the members of the committee that the principal advantage of this is to make this thing come out in the open where everybody will know about it. It is the customary procedure.

Is there any objection, then, to the amendment to section 2?

Mr. MILLER. I move the adoption of the amendment.

Mr. MCDONOUGH. I second the motion.

The CHAIRMAN. You have heard the motion fully seconded. All in favor of the amendment to section 2 make it known by saying "Aye."

All opposed?

The ayes have it.

The subsection is amended.

Mr. MILLER. I move that section 2 as amended be approved.

The CHAIRMAN. You have heard the motion duly seconded to approve section 2 as amended. All in favor make it known by saying "Aye."

All opposed?

The ayes have it. Subsection 2 as amended is approved by the Committee.

Now it is customary to take up the bill as a whole. Is there any further discussion or question in reference to H.R. 4990?

Mr. FULTON. Could I have a question on that?

Mr. MOELLER. Mr. Chairman, this is not specifically on the bill as such, but I would like to ask a question about something we talked about before. We discussed this 5-percent upgrading. It was indicated also there ought to be some interest in a downgrading on this thing.

How seriously is this explored to downgrade? Do you get 2 or 3 bids and say "This is it," or do you drive at this thing to see how economically you can live under it?

Mr. ULMER. As you notice, sir, the construction items are made up of several small parts. It has been the NACA practice in its construction program over 40 years, and it will certainly be the NASA practice, to build these facilities in all their parts as economically as feasible.

This involves hundreds and hundreds of separate contracts. In many cases the bids come in lower than our estimates. In many they come in higher. The 5-percent provision is merely to allow some flexibility in the overall project cost if we get caught on an unusually high bid on one part of the program.

Mr. MOELLER. In each individual one the attempt is made to get this thing done?

Mr. ULMER. A great deal of effort, sir. If we had time I would like to bring in several examples for you.

Mr. MOELLER. I am sure our people are interested in hearing about these things. I think they get the idea we spend as much as we can, rather than as little as we can to do an effective job.

Mr. ULMER. The entire effort throughout the contracting procedure, sir, is to get as much for our dollar as we possibly can.

The CHAIRMAN. Any further questions? Mr. Fulton has a question.

Mr. FULTON. My question is along the same line as the gentleman from Ohio. I was going to ask, Are the various items set out in this bill on your estimated, medium estimates, high estimates, or the lowest possible estimates? What kind of a method did you use to come up with your estimates?

Mr. ULMER. Mr. Fulton, our estimates are prepared by the engineering staffs in our laboratories. They are people with long experience in this field.

As you know, these are very specialized fields. The engineering staffs were brought over with the NACA. They have been building specialized research equipment for over 40 years. We think we have one of the finest engineering staffs for this type of equipment in the country.

These, of course, are preliminary estimates. We do not spend the time and money in preparing the detailed plans and specifications until the authorization has been approved and funds provided.

At that time the engineering is then tailored to the amount of money that has been made available by the Congress and we live within those estimates.

Mr. FULTON. There is no 5-percent cushion overall in here in these figures, in the individual items, which is an override, simply to give you leeway on estimating?

Mr. ULMER. No, sir. I can guarantee you there is none.

Mr. FULTON. There is no upgrading on any percentage whatever?

Mr. ULMER. No, sir.

Mr. FULTON. Of individually estimated figures?

Mr. ULMER. No, sir; these are preliminary engineering estimates as prepared by our staff.

The CHAIRMAN. Any further questions?

Mr. MILLER. Mr. Chairman, I move that the bill be approved as amended and that the chairman be directed to take such steps as are necessary to see it enacted into law.

Mr. DUCANDER. Mr. Chairman, before you proceed with the vote, I would like to call to your attention that S. 1096 passed the Senate yesterday—a bill identical to the bill before this committee.

The CHAIRMAN. I think the correct procedure would be, if we want to do it, to pass this bill out and then substitute the Senate bill. Right?

Mr. DUCANDER. Yes, sir.

The CHAIRMAN. What is the difference, though? Is it identical to our amendment?

Mr. DUCANDER. Yes, sir.

The CHAIRMAN. And your amendment, too?

Mr. DUCANDER. No, sir; we would have to amend the Senate bill.

The CHAIRMAN. Amend the Senate bill?

Mr. DUCANDER. Yes, sir.

The CHAIRMAN. You have heard the motion in reference to H.R. 4990, duly seconded. I would like on this to have a record vote because it is one of our first bills, and we do have a quorum, and I would like the quorum to show the vote.

Mr. MILLER. I think it is a good precedent to set, too, on all money bills—that they be handled by record vote.

Mr. FULTON. One last question: Is the amount that is proposed in this supplemental appropriation bill, H.R. 4990, in total within the limits of the President's budget? Or are we breaking the budget?

Mr. ULMER. Mr. Fulton, the amounts are identical to the amounts in the President's budget.

The CHAIRMAN. The Budget has approved all of these items?

Mr. ULMER. Yes, sir.

The CHAIRMAN. Mr. Ducander, will you call the roll on that motion?

Mr. DUCANDER. Mr. Brooks?

The CHAIRMAN. Aye.

Mr. DUCANDER. Mr. Martin? [No response.] Mr. McCormack? [No response.] Mr. Fulton?

Mr. FULTON. Aye.

Mr. DUCANDER. Mr. Miller?

Mr. MILLER. Aye.

Mr. DUCANDER. Mr. McDonough?

Mr. MCDONOUGH. Aye.

Mr. DUCANDER. Mr. Teague?

Mr. TEAGUE. Aye.

Mr. DUCANDER. Mr. Chenoweth? [No response.] Mr. Anfuso?

The CHAIRMAN. Mr. Anfuso gave me his proxy and said to vote him for the bill.

Mr. FULTON. I have a proxy for Mr. Chenoweth. I vote "Aye" for Mr. Chenoweth.

Mr. DUCANDER. Mr. Osmers?

Mr. OSMERS. Aye.

Mr. DUCANDER. Mr. Sisk?

Mr. SISK. Aye.

Mr. DUCANDER. Mr. Van Pelt?

Mr. VAN PELT. Aye.

Mr. DUCANDER. Mr. Mitchell?

Mr. MITCHELL. Aye.

Mr. DUCANDER. Mr. Baumhart?

Mr. BAUMHART. Aye.

Mr. DUCANDER. Mr. Quigley?

Mr. QUIGLEY. Aye.

Mr. DUCANDER. Mr. Bass? [No response.] Mr. Hall? [No response.] Mr. Riehlman?

Mr. RIEHLMAN. Aye.

Mr. DUCANDER. Mr. Wolf?

Mr. WOLF. Aye.

Mr. DUCANDER. Mr. Karth?

Mr. KARTH. Aye.

Mr. DUCANDER. Mr. Hechler?

Mr. HECHLER. Aye.

Mr. DUCANDER. Mr. Daddario?

Mr. DADDARIO. Aye.

Mr. DUCANDER. Mr. Moeller?
Mr. MOELLER. Aye.
Mr. DUCANDER. Mr. King?
Mr. KING. Aye.
Mr. DUCANDER. Mr. Roush?
Mr. ROUSH. Aye.
Mr. DUCANDER. Mr. Chairman, on this vote, 20 have voted "Aye," and no members voted "No."
The CHAIRMAN. The bill, then, is adopted unanimously. I congratulate the committee on being unanimous, too, on the bill. It will help us when we come to the floor of the House.
Do I hear a motion to amend the Senate bill as we amended H.R. 4990 and substitute the Senate bill for H.R. 4990?
Mr. MILLER. Mr. Chairman, my motion included the statement that the chairman take such parliamentary procedure as was necessary to make the bill become law. I think that covers that phase.
Mr. MCDONOUGH. The committee has got to pass on the amendment to amend the Senate bill.
Mr. MILLER. We have said "to make our bill law."
Mr. FULTON. In order to be clear, I move we amend the Senate bill at this point by substituting our bill.
The CHAIRMAN. You have heard the motion. Is there any opposition to it? [There was none.] If not, it is so ordered.
I have no particular pride of authorship of this. It is a Department bill. By amending the Senate bill, we can take it up and put it through and it will go to the President. I am sure the Senate will accept the amendment we put in.
Mr. DUCANDER. Mr. Chairman, I will say that I telephoned the assistant staff director of the Senate this morning and discussed the amendment with him. Although he can't speak for the members of the committee, he said that the staff would recommend the amendment that we were adopting.
The CHAIRMAN. All right, you have heard the motion duly seconded. All in favor of substituting the Senate bill as amended, make it known by saying "Aye."
(Chorus of "Ayes.")
The CHAIRMAN. All opposed?
(There was none.)
The CHAIRMAN. Therefore, we will substitute the Senate bill in place of the House bill, with the amendment from the House.
I will take the matter up with the Rules Committee and we will find out at the earliest possible moment when the Rules Committee can hear us on getting a rule on this. Then we will notify the members of the committee when it comes up—we hope, before Easter.
Mr. DUCANDER. The Rules Committee requires that the report be written and printed before they will take up a bill. The staff will go to work on the report immediately, and we hope to have it by the first of the week.
Mr. FULTON. Would it be possible to put this bill on the Consent Calendar?
Mr. DUCANDER. No, sir.
The CHAIRMAN. Too much money.

Mr. FULTON. Certainly as to the amount of time we would ask for debate, I believe it should be kept to a minimum.

The CHAIRMAN. That is left to the Rules Committee.

Mr. MCDONOUGH. There is no time element on a supplemental. It is a privileged bill. It goes through without rules.

Mr. DUCANDER. No, sir.

The CHAIRMAN. This is not the authorization. The appropriation goes through with privilege, but not the authorization.

Mr. FULTON. I wouldn't ask for more than an hour.

Mr. DUCANDER. They usually ask the chairman how much time he will require.

The CHAIRMAN. We will ask for an hour's time if it is all right with the committee. We thank you gentlemen very much. There is no use for you to stay. However, we do have a witness here. Isn't he from NASA?

Mr. DUCANDER. Mr. Chairman, the other day when we were having hearings on space law, we didn't have time to take Mr. John Johnson, the General Counsel of NASA. He is here this morning and can give his statement. Although it is almost 11:30 and I know that the House convenes in joint session today, I think you would have time to hear him and we would like to have his statement in the record.

The CHAIRMAN. He is here and he came prepared. I think we should hear him. So, if there is no objection, Mr. Johnson, will you come forward?

(Whereupon, at 11:30 a.m., the committee proceeded to the consideration of other business.)

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